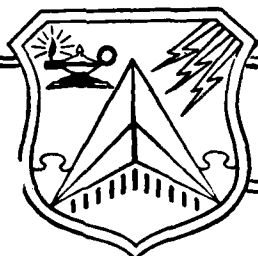


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U. S. TECHNOLOGY TRANSFER TO THE
SOVIET UNION: A DILEMMA

RESEARCH REPORT

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No. MS094-81 By Rodney P. G. Bricker

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AIR WAR COLLEGE
AIR UNIVERSITY (ATC)
UNITED STATES AIR FORCE
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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MS094-81	2. GOVT ACCESSION NO. AD-A107313	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) U.S. Technology Transfer to the Soviet Union: A Dilemma.	5. TYPE OF REPORT & PERIOD COVERED Research Report	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Rodney P. G./Bricker, USAFR	8. CONTRACT OR GRANT NUMBER(s)	
9. PERFORMING ORGANIZATION NAME AND ADDRESS AWC/EDRM Maxwell AFB AL 36112	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
11. CONTROLLING OFFICE NAME AND ADDRESS Commandant Air War College Maxwell AFB AL 36112	12. REPORT DATE Apr 81	13. NUMBER OF PAGES 141
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report) UNCL	15a. DECLASSIFICATION DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) <div style="border: 1px solid black; padding: 5px; text-align: center;"> BXXXXX US GOVERNMENT AGENCIES ONLY XXXXXX Proprietary Information XXXX Approved for public release; distribution unlimited. </div>		
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AIR WAR COLLEGE RESEARCH REPORT SUMMARY
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A Dilemma

AUTHOR: Rodney P. G. Bricker, Colonel, USAFR

In the late 1950s, the United States began "building bridges" to the Soviet Union. The bridges were multi-spanned and one of them was technology transfer. The transfer of technology from the U.S. to the Soviets started to accelerate during the Nixon administration, especially in 1972 with the start of detente and the President's visit to Moscow. The pace increased even more briskly through the first three years of the Carter Administration. Today, the entire question of technology transfer is under serious discussion. What is the status now? What is the role of the Department of Defense? What are the interests of the Commerce Department and the Department of State? Does the nation need an Office of Strategic Trade to control the movement of strategic commodities and critical technologies? Is such an independent office necessary to serve the interests of both business and industry and still hold the proper concern for national security?

This study examines the background of the past 10 years of technology transfer, the Bucy Report then and now, activities at the Departments of State, Commerce, and Defense, the role of the FBI and of the National Technical Information Service, describes a typical tough technology transfer review, gives the Soviet perspective, and looks at many Soviet visitors who are "students."

The proposed Office of Strategic Trade is explained and proposed as one solution to the problem derived from many points of view, while another equally manageable and effective approach aimed at refining the present organization and keeping the responsibility in the Department of Commerce also is discussed.

AIR WAR COLLEGE
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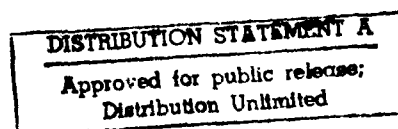
by
Rodney P. G. Bricker, [REDACTED]
Colonel, USAFR



A RESEARCH REPORT SUBMITTED TO THE FACULTY
IN
FULFILLMENT OF THE RESEARCH
REQUIREMENT

MAXWELL AIR FORCE BASE, ALABAMA

April 1981



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BIOGRAPHICAL SKETCH

Colonel Rodney P. G. Bricker (B.A., Drake University) is a Reservist assigned to the Air Force Intelligence Service Reserve Force since 1969. He served as commander, Detached Training Site 7 of the Air Force Intelligence Service Reserve at Headquarters, United States Readiness Command, for seven years before he attended the three-month residence National Senior Intelligence Course at the Defense Intelligence School prior to his assignment to the Air War College. His mobilization position is with the 7113th Special Activities Squadron, Lindsey Air Station, West Germany. On active duty for six years, he served in the Intelligence and Public Affairs fields at Wiesbaden, Germany, and Omaha, Nebraska. In civilian life he specialized in written and spoken communication with General Dynamics, Electronic Communications, Inc., and the Westinghouse Electric Corporation. He served as a consultant in public relations to aerospace contractors in the Cape Canaveral area. He holds an advanced membership in the Society for Technical Communication. A native of Des Moines, Iowa, he is a graduate

of the Air Command and Staff College, Industrial College
of the Armed Forces and the Air War College, by cor-
respondence or seminar. Colonel Bricker is a graduate
of the Air War College, Class of 1981.

ACKNOWLEDGEMENTS

This project began while I was attending the National Senior Intelligence Course at the Defense Intelligence School during the spring of 1980. Lt. Col. James W. Dearlove of the Defense Intelligence Agency made a presentation on the transfer of technology to the Soviets that sparked a great interest in exploring the problem in detail. I am deeply indebted to Carl E. Burk, the Central Intelligence Agency advisor to the commander, Air University, and a member of the faculty of the Air War College, who served as the faculty advisor. A long-time friend, mentor, and fellow reservist, he provided support, inspiration, and helpful encouragement. The library staff at the Air University Library were all professional and helpful; and in particular I would like to cite Herman Hall, Pat Horsch, Joan Hyatt, Shirley Laseter, and Tomma Pastorett, for their continuing aid, encouragement, and inspiration. And, finally, I want to thank my wife Nona and daughter Laura for their understanding of long and odd hours, unusual requirements for meals, and most of all the great need for isolation. Their help and support made it possible.

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CHAPTER I

INTRODUCTION

Technology transfer to the Soviet Union is featured in the newspapers and television programs with increasing frequency in the last few years. What exactly is technology transfer and what is the reason not to transfer it to the Soviet Union? Why all the interest?

Technology is the use of science for the design and manufacture of products and services. Products themselves are not technology, but are the result of the use of technology. Science is not technology either, but instead is that activity which is focused to develop knowledge. Throughout civilization today, scientific information must be circulated and exchanged to increase man's knowledge. According to J. Fred Bucky, president of Texas Instruments, basic scientific information should continue to flow freely around the world without restriction. On the other hand, technology is that detailed information necessary for design and manufacture. It is normally proprietary or privately owned and closely guarded.¹

Thus, technology is made up of the information

necessary to design and produce products. But that in itself does not seem all so critical to the general public in the United States; so the question still stands: why all the interest?

Since President Nixon signed the Export Administration Act of 1969, the Soviet Union² and the United States have conducted a number of programs involving student exchanges, information exchanges, and selling and purchasing agreements. For years, the Soviets have sent students to the United States for study, and U.S. students have gone to the U.S.S.R. There has been a relatively free exchange of professional and scientific literature between the two countries. And there are missions or commercial trade activities for selling products and services between the two countries.³

There are many aspects to technology transfer, and one of the most critical is the military or war-making potential aspect. The facets of technology transfer which affect the war-making potential of the U.S.S.R. will be explored in this research paper. What technical capabilities are being provided by the United States to the Soviet Union which will increase the ability of the Soviets to wage war against the United States? How do the Soviets

obtain this capability? What are the dangers of selling technology to the Soviets? How can the situation be corrected, if it needs to be corrected? These and other questions related to the transfer of technology for potential military use will be explored.

The fundamental elements of the technology transfer question are the following:

1. The United States has a technology edge of two to 10 years for selected technologies over the Soviet Union and most of the other countries of the world.⁴ A government expert who wished to remain unidentified says that the Soviets trail by about three years in basic science, but warns, ". . . in weapons technology, a scientific lag of three years is virtually no lag at all."⁵
2. High technology in the areas of electronics, metallurgy, aircraft, and space flight, directly support the Soviet war-making capability.
3. Much of the high technology in these areas, if not directly related to improving the Soviet war-making capability, can be easily adapted from its original purpose so that it will support Soviet military developments.

Thus, the United States finds itself in a position of providing the Soviets with the means of reducing the U.S. technology lead by use of student and information exchanges and purchased technology. In the process, they improve their war-making capability.

It was Lenin who said,

The inherent contradiction of capitalism is that it develops rather than exploits the world. The capitalistic economy plants the seeds of its own destruction in that it diffuses technology and industry, thereby undermining its own position. It raises up against itself foreign competitors which have lower wages and standards of living and can outperform it in world markets.⁶

CHAPTER II

THE BUCY REPORT, THEN AND NOW

The Department of Defense asked the Defense Science Board for an assessment of the control of technology transfer with military significance to the Soviet Union and Warsaw Pact countries. The Defense Science Board established the Task Force on Export of U.S. Technology in the spring of 1974 for that purpose. J. Fred Bucy was named chairman of the task force, and the report produced is commonly known as the Bucy Report, which was issued almost two years later in February 1976.¹

The task force was made up of 15 representatives from government and industry. Six were from the Department of Defense, and one each from Commerce, the CIA, and the Council on International Economic Policy, the White House. There were two industry representatives from Texas Instruments and one each from McDonnell Douglas Astronautics, General Electric, Perkin-Elmer, and Xerox. In every case, the individuals held highly responsible positions within their organizations. It would be considered a "blue ribbon" panel. There were four subcommittees

specifically examining airframe, jet engine, instrumentation, and solid state technology transfer. Each of the four subcommittees had one or two representatives from the Department of Defense, and between four and eight executive-level industry representatives.²

The task force examined CoCom, which is an association of nations which cooperate in the banning of export of strategic technology to communist countries, including the Warsaw Pact, People's Republic of China, Albania, North Korea, and North Vietnam. The member countries of CoCom are the same as NATO member nations, excluding Iceland but including Japan. CoCom's effectiveness has been somewhat limited because of several factors. Some members have liberally interpreted the rules when there was opportunity for individual gain by the sale of technology to communist countries. In some interpretations, only products are controlled, not data.³

Dr. William J. Perry, Under-Secretary of Defense for Research and Engineering, said,

The sinews that hold CoCom together are not as strong as they were a decade ago, but, in important cases, we generally can prevail, and we can generally get concurrence in not transferring technology. . . . Notwithstanding that, there has been a distressing amount of what I would call leakage of technology

where a technology is transferred without the issue being brought to CoCom, either intentionally or unintentionally.⁴

It is possible to obtain an exception to an item on the CoCom embargo list by agreement of the member nations. During the Nixon administration, Western European nations requested most of the exceptions, but during the Carter administration more than 60 percent of the requests for exceptions came from the United States alone. Obviously, it becomes more difficult for the United States to ask for a firmer stand by CoCom members when we are requesting more exceptions than all other nations combined.⁵

The task force assessment established that,

. . . export control restrictions reinforce the need for export controls and the CoCom (Coordinating Committee) agreement as a defense necessity. The effectiveness of those controls for the more critical technologies needs to be improved. . . . [The Executive Summary also pointed out that] Products of technology not directly of significance to the Department of Defense should be eliminated from controls to enable more effective control of significant items.⁶

Thus, the task force wanted both a strengthening of control on the most critical technology with military significance and an outright end of control on products of indirect significance so more effort could be placed on the more critical areas. The report highlighted the need for policy objectives, simplified criteria, and a

"more pragmatic approach" to review and approval of applications.⁷

The task force had three principal findings:

1. Design and manufacturing know-how are the key elements for control of strategic technology;
2. This know-how is most effectively transferred when there is intent to do so, and the donor organization takes active steps in that direction;
3. High velocity, i.e., rapidly changing technologies are the ones for which export controls are most effective in slowing the flow of technology.⁸

The report pointed out that, because there were no established criteria for evaluation, each application was handled individually, a procedure resulting in delays, ambiguities, and a lack of guidance for U.S. exports to communist countries.⁹

It is in the Department of Defense, the report emphasized, that the initiative lies for development of policy objectives and strategies. It was recommended that knowledgeable representatives from industry and government should develop guides for selected technologies. It was emphasized that defining objectives would strengthen the Defense Department's ability to persuade other U.S. agencies and CoCom to better control critical technology.¹⁰

A significant conclusion was that end-use

statements and safeguards should not be used to control design and manufacturing technology and "keystone manufacturing equipments."¹¹

The report stressed that high-velocity technology should not be exported to neutral countries and that know-how included in weapons sales should not provide any more critical technology than they could obtain if buying straight technology.¹²

The Bucy Report concludes with a statement that export controls are a defense necessity and that CoCom, although increasingly difficult to enforce, is necessary to control technology flow to the communists.¹³

Three years after the report was issued, Bucy, chairman of the task force, spoke at the Armed Forces Communications and Electronics Association Symposium in early 1979, and updated the status of the report. He said, ". . . the basic issues are still obscured and distorted [for four reasons]." The reasons are:

1. Widespread misunderstanding of what technology is;
2. Generalizations that broaden the view from narrow issues to all technology transfers;
3. Unfamiliarity with transfer mechanisms and the impact of significant technology transfer on national security;

4. These factors, misunderstandings and generalizations, and lack of coherent policy, let powerful political pressures obscure the basic issues in each technology transfer case.¹⁴

Bucy faulted the administration for minimal progress during the three years since the issue of the Bucy Report. There were no better definitions of critical technology and no improvements in the implementation of present controls. He added that industry was more anxious than before and suspicion had increased because the administrative bureaucracy makes it appear that their intent is to pursue a policy of "zero risk" and overcontrol exports to communist countries.¹⁵

His 1979 speech reiterated his definitions of products, science, and technology, and he stressed that the issues must be clarified. A policy was proposed which would "meet the challenges" of protecting national security and encouraging trade. "I am searching for the most meaningful controls to enhance our security with minimal disruption of trade," he said.¹⁶

Bucy explained that control of export technology is more difficult today than it was three years ago for three reasons. First, increased trade with the Soviets

is emphasized in U.S. foreign policy. Second, the Soviets still place top priority on getting Western technology--electronics and aerospace, especially. Third, commercial application is leading military use by only three to five years, compared to about 10 years until recently. The example he used was the Large Scale Integration (LSI) integrated circuit (IC) used in hand calculators in the early 1970s, microprocessor use of LSI ICs in the mid-1970s, and only minimal use in military products by 1979.

Controls on technology transfer by the United States and its allies during the five years from 1974 to 1979 were less effective than preceding decades, but still provide some measurable lead time. The lead time is estimated at two to 10 years by the intelligence community, industry committees, and research institutions. Bucy pointed out that objections arise to major policy changes because of uncertainty about their implementation or ignorance and distortion about the need for the policy.¹⁸

Defense Department policies were faulted by Bucy because resources and priorities focused on the strategy of advancing militarily significant technologies almost

to the exclusion of control of critical technology. He agreed with first priority on advancing technology, but said that both technologies must be pursued "on a timely basis." Bucy stressed, "Without controls on the transfer of critical technologies, the effective advancement of military capabilities through R&D becomes an almost impossible problem, for this know-how would be transferred to CoCom countries as quickly as they can purchase it."¹⁹

Unfortunately, he said, during the past five years Defense has given only minimum emphasis to export controls and, thus, other departments seriously question Defense's ability to implement a meaningful policy on technology export. "The control of critical technologies does not need to be absolute in order to be effective." He continued, "Their objective is to delay their rapid acquisition by the Soviets and other controlled countries."²⁰

The continuing significance of the 1976 Bucy Report was emphasized by Representative Paul Findley during July 1980, when he spoke to the House of Representatives to review the findings of the report and stated, "I share the concerns of the Bucy report regarding the great potential for transferring high technology via

scientific exchanges and scientific and technical training in the United States."21

CHAPTER III

THE CURRENT SITUATION

The center of gravity in the competition between the two systems is to be found precisely in the field of science and technology, making the further intensive development of the latest scientific and technical achievements not only the central economic, but also a critical political task, and giving the questions of scientific and technical progress decisive significance.¹

That is the contemporary view of scientific and technical capability of Chairman Leonid Brezhnev.

The evidence has accumulated in recent months that our export control system is a shambles. What we haven't sold (the Soviets), we have given away in educational, governmental, and commercial technical exchange programs. What we haven't sold or given away, they have stolen.²

That is the U.S. perspective on technology transfer from the point of view of Senator Henry Jackson as recently as July 1980.

Dr. William Perry, the Under-Secretary of Defense for Research and Engineering, gets even more precise about it:

The sale of technology to the Soviet Union has been of relatively small benefit to the Western world, but of very great benefit to the Soviet Union--both directly and indirectly assisting their military objectives.³

A private researcher, Dr. Miles Costick, Director of the Institute on Strategic Trade, located in Washington, explains,

It is virtually impossible to identify a single industry in the U.S.S.R. which manufactures only civilian goods. Every institute, every educational institution, every factory has its "first section" staffed by military and KGB representatives.⁴

Dr. Jack Vorona, a Pentagon scientific and technical (S&T) intelligence authority, emphasizes that sales of U.S. S&T equipment to the Soviet Union make "a very significant contribution" to that country's military machine.⁵

Another top Pentagon official who wished to remain anonymous said, "When I think of the hundreds of bits of information I release each year, I shudder to think about the overall picture the Russians are able to obtain of our activities."⁶

"Soviet society would be confronted with intolerable strains without all the assistance they have received from Western countries," according to Dr. Igor S. Glacolev, who left his post as a senior research member of the Soviet Academy of Science in the autumn of 1976 and sought asylum in the United States.⁷

"I believe we can save her [Russia] by trade.

Commerce has a sobering influence . . . trade, in my opinion, will bring an end to ferocity, the rapine, and the crudity of Bolshevism surer than any other method."⁸ This statement, made by British Prime Minister Lloyd George, serves a number of purposes. He made that statement in 1922, and it proves that the situation has not improved in almost 60 years of highly selective trade by the Soviets; it also establishes that, then and now, few people are willing to see the facts about the Soviet Union.

Senator Jackson described the actions and policy of the Carter administration when dealing with technology transfer as "like a brain-damaged spider caught in its own web, unable to extricate itself."⁹ On another occasion, he wrote to then President Carter in mid-1977, saying,

I am persuaded that the effect of our past and current policies in this area has been to enable the Soviets and their allies to acquire technology that bears importantly on the military balance between East and West. . . . In my judgment, our current condition can best be described as acute hemorrhaging.¹⁰

The outspoken senator also went on record as saying,

It doesn't seem to occur to the White House that trade with the Russians may be intrinsically bad. The illusions of detente combined with short-sighted

trade promotion have dangerously eroded our national security. The Russians must think we are a bunch of saps.¹¹

In spite of all these comments and many others of a similar nature, the trade continues because the Department of Commerce is interested mainly in fostering trade and increasing exports. The Department of Commerce is fiercely sensitive to the issue, and attempts to ignore questions.

Conservatist columnist Stanton Evans filed a lawsuit against the Department of Commerce requesting the names of companies trading with the Soviet Union, the nature of the technology exported, and the value of the exports. The reaction by the Department was to urge Congress to enact a secrecy provision that would allow them to withhold information from the news media concerning export licensing. Evans described the situation as,

. . . one of the most blatant cover-ups in recent political history . . . it is a blanket of secrecy being draped around the question of technology transfer to the Soviet Union. There is considerable evidence that computers, truck plants, ball-bearing machinery and other products of Western industry have been used by Moscow to build its war machine--the Soviet invasion of Afghanistan, employing vehicles from the Kama River truck plant, providing a recent example.¹²

This is the expression of the anti-export

advocates. But what specifically has occurred in the last few years to bring on such a strong feeling of a bad policy for the export of technology? Here are examples, as told by a Senate investigator to the magazine Industrial Research and Development:

Two huge truck factories were built in the Soviet Union in the early 1970s and equipped predominantly with U.S. and West European machinery, techniques, and processes. Experts claim that the Kama River plant and the Zil plant are producing military trucks, tank engines, missile launchers, and armored personnel carriers.¹³

It took 11 years of trying before the Soviets finally succeeded in buying 164 precision ballbearing grinding machines to produce miniature ballbearings with exceptionally accurate tolerances. The machines, bought in 1972, permit the Soviets to produce missile-guidance systems and gyroscopes which allow them to use MIRV warheads, according to intelligence sources. It was a \$20 million deal for Bryant Chucking Grinder Company.¹⁴

In late 1978, in spite of strong opposition from members of Congress, recommendations against the license from Department of Defense officials and a negative recommendation from a special Defense Science Board headed by

J. Fred Bucy, President Carter approved the sale of an oil well drill bit factory, which will place the Soviets into international drilling competition with the United States and provide a scientific base for production of armor-piercing shells. The \$144 million plant was sold by Dresser Industries. A third objection to the sale was based on the computerized electron-beam welding equipment, which gave the Soviets the potential for nuclear and laser uses as well as refinements in aircraft production.¹⁵

The GeoSpace Corporation of Houston sold more than 35 array processors to the Soviet Union and the People's Republic of China. A U.S. expert on Soviet use of U.S. technology states that the GeoSpace units,

. . . assist the computer in digital signal processing and signal analysis, which enables the computer to identify tiny differences in the sounds under the ocean's surface, a process which yields the location of enemy submarines.

Later the company sold seismic equipment to the Soviets, the Chinese, and others, without requirement of an export license, which prompted the Department of Commerce to fine GeoSpace \$36,000 and remove its export privileges. A former Soviet intelligence expert and Soviet Navy personnel were trained by GeoSpace at Houston, according to

disclosures made by the Soviet intelligence expert to Dr. Miles Costick, director of the Institute on Strategic Trade. The Soviet reported that he carried GeoSpace units aboard Soviet submarines and ships, and installed them adjacent to the ship's computers.¹⁶

The Soviet acquisition and use of U.S. computers and computer technology is a story in itself, but the highlights alone are an awesome collection of facts that illustrate the Soviet determination to obtain U.S. computer technology.

U.S. defense and intelligence experts say that the Soviets and Warsaw Pact surrogates make such powerful efforts to get vital computer technology that they believe the Soviets seriously trail the United States in computer technology. IBM officials reported that they were ". . . stunned to find four to five times as many IBM machines as they thought were there" after a visit to Eastern European countries. An expert said there was no doubt the computers had been obtained by illegally "diverted" shipments through third countries. A Senate committee was advised by Dr. Vorona that IBM models 360 and 370 were the design basis for a complete series of Soviet computers. Dr. Vorona stated that the IBM computers

were "illegally diverted into the U.S.S.R. in 1971 and 1972." Another technology transfer expert said that the Soviet Ryad I and II series of computers are copies of the IBM 360 and 370. The same expert said that the Ryad I and II are the Soviet's basic computer workhorses.¹⁷

H. Eugene Douglas, Director of International Trade and Government Affairs, Memorex Corporation, states,

From the start of the Ryad project down to the present day, the Soviets have covered the spectrum of activities--overt and covert, legal and illegal, commercial, diplomatic, and academic--to strengthen their computer industry.

Douglas explains that East European officials admitted they announce potential contract offerings just to get technical responses from Western computer products. He added, "As often as not, the responses provide valuable clues to correct errors in Ryad work and give indications as to where Western technology is headed."¹⁸

A technically sophisticated air traffic radar system was recently purchased from the United States by the Soviets for use at Vnukovo Airport, Moscow. Larry Brady, a former Department of Commerce employee, said the equipment was obtained through a loophole in U.S. export regulations. In the interest of detente, it was deliberately left open, according to Brady, who continued,

"[This system] is far more sophisticated than most widely-used traffic control systems," even in the United States. He warned, "Such enormous capacities would have obvious military potential."¹⁹

In 1977, under a U.S.-U.S.S.R. chemical environmental exchange program, two American scientists "were very suspicious" of what the Soviets were developing in the laboratory, according to a Senate investigator who would not allow his name to be used. According to the investigator, the American scientists closely monitored the Russian activities and explained their suspicions to a Senator on their return to the United States. The fact that the exchange program worked solely to the benefit of the Soviets (all information flowed in one direction--toward the Soviet Union), who received valuable information and expertise from the United States, caused the American scientists to express grave concern. A CIA report stated that nearly all the Soviet Union's chemical technology is based on Western equipment and related process data. About 80 percent of Soviet polyethylene and 75 percent of their chemical fertilizer are produced with Western equipment.²⁰

The Soviet Union is developing laser technology

that, according to a report sent to President Carter in May 1980, could produce an antisatellite laser weapon which could be in service by the mid- to late-1980s. Precision laser mirrors produced by the Spawr Optical Research Company cannot be exported to the Soviets because the Department of Commerce believes they might be used in Soviet "killer satellites," according to Walter Spawr, president of the company. He says their fears are unfounded, and that, anyhow, his mirrors are not built for the power levels used in weapons. Laser technology is one of those dual-use technologies which permits industrial and civilian technologies to be easily converted for military use. U.S.-produced laser systems have been shipped to the Soviet Union according to a Department of Commerce document.²¹

There are a number of other areas of concern in which the Soviets are using U.S. technology obtained illegally or for military purposes. Here are examples of those areas of concern.

A White House study concluded that an estimated \$150 million in U.S. exports have been illegally exported through diversions, re-exports through third countries, and plain theft resulting in the acquisition by the Soviet

Union. Scientific, educational, technical, and commercial exchange programs resulted in training hundreds of Soviet military engineers and technicians.²² The programs, during the surge of detente, were to improve political relations, not exclusively to exchange scientific knowledge, according to officials.²³ Dr. Ned Austenso, head of the National Oceanographic and Atmospheric Administration Soviet exchange program, said, "I think they [the Soviets] get more out of it than we do." He added that the programs were established, ". . . to promote intergovernmental relations and not necessarily to promote science."²⁴ Soviets have come to the United States to study plasma physics, metallurgy, computerized machine control, ferroelectric ceramics, photoelectrics, and semiconductor technology. U.S. scholars have little interest in Soviet science and seem to be concerned primarily with Soviet and Russian history, arts, and letters.²⁵ It was Lenin who said, "They'll sell us the rope"; and it was Jackson who said, "What we don't sell, they steal."²⁶

CHAPTER IV

THE SOVIET PERSPECTIVE

In the United States, there are a number of views on the transfer of technology to the Soviet Union. These are sometimes conflicting, contradictory, supportive, or alarming. There are few who support the mass transfer of technology to the Soviets. There are some who attempt to examine the question from the point of view of a Soviet scientist and his appreciation of technology coming into the Soviet Union from the United States. An opportunity to explore this view comes from Dr. Anatoly P. Fedoseyev.

Dr. Fedoseyev, a native of Russia, was born in St. Petersburg in 1910. He graduated from the Electrotechnical Institute in Leningrad in 1936, and was assigned to the secret division of the "Svetlana" plant in Leningrad as an engineer. Since his first assignment in 1936, he has been involved continuously in secret military electronics work.¹ During 1938 and 1939, Dr. Fedoseyev supervised a group of Soviet engineers who were sent to the United States to study vacuum electronics at an RCA plant in New Jersey. In addition to gaining a substantial background

in the science of vacuum electronics, the Soviet engineers prepared a number of engineering reports which were sent to the Soviet Union.²

After this assignment in the United States, Dr. Fedoseyev returned to the U.S.S.R., and in 1940 worked on the development of a secret, powerful transmitting tube for use in the television transmitter at the Palace of Soviets in Moscow. From this point on, Dr. Fedoseyev's professional career continued to expand in terms of responsibility and technical level. He was chief of a transmitting tube manufacturing operation in Siberia in early World War II. He created the Research Institute 160, which has grown through the years until it employed 15,000 in recent years. He was the primary developer of power magnetrons and modulating tubes for use in ground, sea, and air radars, many of which are still in use.³ Additionally, his electronic innovations are used in particle accelerators, thermonuclear projects, and the anti-ballistics missile defenses of Moscow. He has been honored with the Order of Lenin and the Order of Labor of the Red Banner. He received Lenin's Prize and the Gold Medal in 1960 for his inventions. He has been awarded 16 certificates of invention. Dr. Fedoseyev was a member

of the Experts Committee at the Supreme Attestation Commission. He was honored with the award of the title of Honorary Worker on Science and Technology in 1970, and in 1971 he received the Gold Medal of Hero of Socialist Labor and the second Medal of Lenin's Order. The next year, while visiting the Le Bourget Aviation Exhibition in May, he elected to not return to the Soviet Union and now lives in England.⁴

Thus, Dr. Fedoseyev is an undeniable expert on electronics development in the Soviet Union, and now is in a position to express his opinions openly concerning the use of U.S. technology in the Soviet Union. There may be detractors of his opinion who would say that his information is dated, and is at least 10 years old; but it is significant to note that his observations were made prior to detente and thus a "closed period" for the flow of U.S. technology to the U.S.S.R., especially compared with the nearly open-door policy of the 1970s.⁵

Here, in Dr. Fedoseyev's own words, are the organized methods of obtaining U.S. technology, the uses for it in the Soviet Union, and the value placed on it.

The collection of information starts with the analysis of rumors and implications appearing in the press, radio and television in the United

States, and generally in the West.

If the analysis of these rumors, for instance, proves to be of substance and leads to something important and useful for the Soviet Union, then the exploration of the entire research and technological base for the new weapon or military equipment--the source of this rumor--is launched.

A final decision concerning the significance of the subject under study is made in the U.S.S.R. in the specialized research institutes existing for that purpose.

During this phase of the operation, the Soviet agencies of the diplomatic and foreign trade services are fully used by means of visits, trade and technical exchange programs with the U.S. firms involved, and the appropriation of catalogues, descriptions, specifications and technical reports. All these efforts permit the acquisition of a rather accurate picture of the subject under consideration without contacting the "main" firm.

Next, strictly "technical" (intelligence) methods are used; such as, stealing, illegal purchase of samples, etc.

In the final outcome, this new subject of military interest is fully researched and, if necessary, reproduced as a copy or modified to comply with production methods in the U.S.S.R.

I dealt very often with American blueprints, and technical reports, marked "confidential" or "secret" or even "top secret." Just as often I participated in research and analysis of samples of the U.S. technology, either purchased or stolen.⁶

In 1938 and 1939, Dr. Fedoseyev was collecting technology while assigned to an RCA plant in New Jersey as part of an organized collection program by the Soviet Union. Here are the details of that structured technology-collection effort, which even included the outright purchase and shipment to the Soviet Union of

complete manufacturing plants.⁷

Already in 1939-1940, as Deputy Chairman of the Commission of the Main Administration of the Low Current Electrical Industry of the U.S.S.R., I was participating in a program of technical assistance to the U.S.S.R. from RCA. The agreement of assistance with this firm was used by the Soviet Union for the penetration of many other U.S. firms in order to obtain detailed data about the composition, operations, equipment, and technology of the electronic industry in the United States in general. This penetration was accomplished further by the purchasing of samples and small orders of equipment and parts, and, in some cases, of the entire plants from RCA and other firms.

This activity was extended into the U.S.S.R. by reprinting all useful technical publications of the U.S.A. and the West, and by the highly professional technical information service in our industrial and academic institutes.⁸

However, the question should be asked: To what extent did this technology collection program cover the entire electronics industry, and to what depth? Here is Dr. Fedoseyev's chilling answer, and it comes from more than 40 years ago, when the Soviets and the United States were potential allies against Nazi Germany.⁹

Our detailed knowledge of the U.S. electronic industry very often surpassed that of the American engineers and administrators.

Without question, our knowledge of the entire technical field in the United States was far exceeding such knowledge of the same field in the U.S.S.R. itself.¹⁰

Still, many readers would believe that the Soviets,

in a mood of cooperation and aid in anticipation of the hostilities of World War II, would be sharing technical information and reciprocating, at least on a scientist to scientist basis; but the circumstances were to the contrary. Here, Dr. Fedoseyev gives details on Soviet security measures to keep all facets of Soviet technology from any nation which might learn new information or determine its lead over the Soviet state of the art.¹¹

This has been always a good security measure, since the Soviet scientific visitors abroad could not disclose to a meaningful degree any secrets about the new Soviet military technology.

The highly organized and greatly centralized military-technical machinery of the U.S.S.R. is outstandingly effective in obtaining new U.S. and Western technology and in preventing the reverse process. Many times, advanced technology was requested for research, and it was provided.¹²

Again, the doubting reader may attempt to give the Soviets every benefit of innocence. The rationale may be,

These are efforts by the production facilities for civilian goods and produced to be used to support home requirements for use by the general population and for export to the peoples of the world. The Soviets would not use "civilian" front organizations to collect technical information for military use. They are too backward and not that well coordinated.¹³

Here again, Dr. Fedoseyev explains the relationship where there is no real "civilian" industry, and that the entire country serves the military in one form or another.

It should also be considered that there is practically no strictly and purely "civilian" industry in the U.S.S.R. The entire country in one manner or another serves the military establishment and purpose. In consequence, very often, innocent looking research institutes--as for example the Institute of Agricultural Machinery--are in reality military institutes, and the representatives and visitors in the United States from such institutes are nothing but representatives of the Soviet military establishment.¹⁴

It is of great consequence to be fully aware of the fact that, as Dr. Fedoseyev describes, the most innocent looking scientific or research institute, or request for information, materials, or equipment, is in reality likely to be in direct support of the Soviet military. Again, his words, for emphasis, ". . . nothing but representatives of the Soviet military establishments."¹⁵

When a long-term Soviet user of U.S. technology places such a significant value on that technology, it is overwhelmingly obvious that the United States is not only "selling them the rope," but is also giving "no-interest credit" at the same time. It seems almost as though the United States would provide anything to make it easier for the Soviets. The multifaceted approach to collection of U.S. technology shows strong interest at the highest level of national government in the Soviet

Union. For the various and at times uncooperative administrative entities of the U.S.S.R. to work in harmony is a strong positive indication that the Soviets have an intense demand for U.S. high technology and know that it is quicker and cheaper to obtain it from the United States than to develop it in the Soviet Union.

CHAPTER V
THE DRESSER FILE

The sale of U.S. products or manufacturing capability has been a long-term question from the technology-transfer point of view. It is a multifaceted problem that is not simply answered. For example, U.S. industry needs to make sales to be profitable so it can continue research and maintain a technological lead over the rest of the world. Sales to the Soviets mean profit, and thus aid in retaining the leading edge in technology. That is one philosophy, but it has an opposite side, which is: Why sell the Soviets anything that can be diverted for military use to their benefit, or give them a production advantage to become competitive with the United States in the international marketplace? This latter school of thought also feels that any freeing of talent, funds, or resources, from one area of deficiency in the Soviet Union as a result of purchased technology from the United States, allows detrimental research and development by the Soviets.¹

A current classic example of this conflict is

the Dresser Industries case. It is the perfect case study of attempting to balance the risks of selling technology capability. In this instance, the technology has aspects which could be diverted from civilian use to military weapon development. This is the primary risk that was balanced against financially rewarding sales by a U.S. manufacturer who is in business to make a profit and would use a percentage of the profit to perform more research and development to maintain the U.S. technological edge over the Soviets, be it in commercial areas or in the military equipment domain.²

A look at the highlights of the review process for the Dresser request for export will illustrate the complexity. They include the review for risk, the approval process, and subsequent congressional review of the situation. Here are the highlights of the military technology factors in the Dresser case.

Dresser Industries, Inc. is a Dallas, Texas, company which produces drill bits used in deep well petroleum exploration and exploitation. These bits, normally known as rock-drill bits, are produced by four U.S. companies, and, to a much lesser extent, one or two foreign companies. For many years, the rock-drill bits were produced only by

Hughes or Reed, and today those two firms serve 75 percent of the international market for the unique bits. As the patents expired in the past five years, two other U.S. companies have become small factors in the production and marketing of rock-drill bits. They are Smith and Dresser, both of which are considered small, but competitive and growing. It is interesting to point out that the rock-drill bit sale discussed here is not the first contact between the Soviets and Dresser for technology in the oil production industry. In the mid-1950s, the Soviets purchased turbodrills from Dresser.³

For a clear understanding of the significance of the transfer of technology, it is necessary to explore in some detail the manufacturing and marketing of rock-drill bits. The technology is concentrated in the United States, and comparable rock-drill bits cannot be made by foreign producers or even the foreign subsidiaries of Hughes. Principal suppliers do not sell rock-drill bits, but lease them to users. Apparently, this is because the housing has a relatively long service life, but the teeth and bearings need frequent replacement. Thus, the ownership is retained by the manufacturer, who rebuilds the product and leases it again to the user. It is also

significant that the manufacture of rock-drill bits is considered to have an element of "art" involved and that this element is derived from a collection of experience by individuals in the producing firms.⁴

A number of other significant factors on the transfer of rock-drill bit technology to the Soviets is brought to light in a report by J. Fred Bucy, but because these elements are concerned with petroleum exploration and production by the Soviets, which are economic factors, they do not bear directly on the military advantage which the Soviets may have gained, and thus are not addressed. As discussed in Chapter II, Bucy was chairman of a task force appointed by the Defense Science Board to investigate technology transfer. From the overall view of national security and international dependence on petroleum, these factors are highly significant and are of the type that should have been investigated by the Department of Energy and the Department of Commerce, to insure that the United States would not "sell for \$1 today what would give the Soviets an untold economic and political advantage next year," through their ability to produce petroleum for internal consumption as well as marketing to other countries.⁵

There are recognized authorities who believe that it would be better for the United States if the Soviets were able to take care of internal petroleum needs and export to the Warsaw Pact nations, because it would keep the Soviets out of competition for the Mideast oil as well as other sources, and make them less troublesome to the United States.

Rock-drill bits are only a single element of the deep well drilling process. The capacity the Soviets wished to buy would have resulted in production of 100,000 rock-drill bits per year, which was judged to be excessive to their requirements through the mid-1980s, considering that they would not have a comparable level of capacity in other required elements of deep well drilling.⁶

The sensitive technology elements of rock-drill bits centers on the tungsten carbide inserts. In spite of the fact that this is an "old" technology, it still continues to be concentrated in U.S. firms, which may license to production to "U.S. foreign firms," whose quality is grossly inferior to U.S. products. More significant is the non-scientific "art," which is necessary to make effective inserts for rock-drill bits. It is assumed that this art would be quickly developed by the Soviets once they had

started their own production. Documentation provided by the Department of Defense significantly noted that the tungsten carbide technology could be diverted readily for military uses.⁷ The tungsten carbide face is fused to the drill bit through the use of computer-controlled electron-beam welding. Tungsten carbide is an essential ingredient in the production of effective armor-piercing shells.⁸

electron-beam welding capability is significant from the point of view of computer control of the electron-beam welding process. In the application anticipated by the Soviets, the computer would perform the following functions:

1. Position the workpiece;
2. Position the path of the weld;
3. Control the buildup of current and voltage supplied to the electron beam, based on a predetermined profile.⁹

This is highly significant from several perspectives. First, it results in a more uniform weld because of better penetration. Both uniformity and penetration are critical factors in welding refractory materials and titanium. This type of welder is used in the United States on nuclear components and swept-wing aircraft parts. Although similar

electron-beam welding equipment has been shipped from West Germany to Eastern bloc countries (which, of course, means complete availability to the Soviets), there have been no indications that computer controls have been available for this class of electron-beam welding equipment. In spite of the negligible United States lead over the U.S.S.R. in this type of computer, the feeling of some experts is that the export should be denied because of military significance to the Soviets, and that the denial should remain in effect until a comparable capability is available in the U.S.S.R. or Eastern bloc countries.¹⁰

An additional request by the Soviets was for 6-spindle, 5-axis numerically-controlled machine tools to be used for cutting teeth in the rock-drill bits. Usually 6-spindle, 5-axis numerically-controlled machine tools are custom products used only for highly specialized machining. U.S. suppliers of rock-drill bits cut teeth with 2-spindle machine tools. There was no explanation as to why the Soviets requested machine tools with such significantly greater capability than required for cutting teeth in rock-drill bits. There was no comment nor speculation on the possibility that the far more capable machine tools could be used for developing and advancing the

state of the art of armor-piercing projectiles.¹¹

The Dresser application started when the request for license and supporting documents was filed with the Department of Commerce on February 15, 1978.¹² The Department of Commerce personnel who are involved in technology transfer applications and U.S. business and academic communities are guided by a Department statement of policy. The policy explains that the Export Administration Act of 1969, and the 1972, 1974, 1976, and 1979 amendments, control the flow of technical data and commodities from the United States to foreign countries. It specifies that the Department of Commerce has the responsibility for administration of the Export Control Act. Export is defined as information in any form released in the United States to a foreign national for use abroad, and states that written authorization from the Export Administration Office in Commerce is required prior to release. It allows the unrestricted export of unclassified information which is generally available to the public or which is scientific and educational in content. The Department of Commerce policy further clarifies scientific and educational as:

1. Information not directly related to industrial process

information used for design, production, or utilization, and

2. Instruction in schools and laboratories, provided that exclusions are made for research under contract for information on design, production, and utilization of industrial process information.¹³

The Department of Commerce requested some additional information from Dresser and then made an evaluation of the technical data in the application and forwarded it to the Department of Defense.¹⁴

The Department of Defense organization which is responsible for technology review reports to the Secretary of Defense, and includes the principal deputy under-secretary for Policy and assistant secretary for International Security Affairs (ISA), and the Office of Technology Trade in the function of the deputy under-secretary for International Programs and Technology. An organization chart is included as appendix A.¹⁵

The application went from the Department of Commerce to the Department of Defense, and more specifically to the assistant secretary of Defense for ISA on April 11, 1978, who later transmitted the request to the Office of Defense Research and Engineering, Research and Advanced

Technology, Assistant for Manufacturing Technology, Dr. Lloyd Lehn.¹⁶ Dr. Lehn, a specialist in mechanical and manufacturing engineering, did not feel qualified to evaluate the application and forwarded it to Dr. Edward Wright, a metallurgist and director of the Army Material and Mechanical Research Center.¹⁷

Dr. Wright's qualifications include serving as an independent consultant to Dresser about 10 years prior to going to work for the Army research center, and he therefore had a strong background in rock-drill bit design and manufacture. During his employment with the Army, Dr. Wright has accomplished research and development work on armor and armor penetrators. Dr. Wright sent a recommendation on May 23, 1978, that the application be denied because both plant and technology could be diverted and used for the production of tungsten carbide penetrators. On that same day, May 23, 1978, ISA was advised of Dr. Wright's negative recommendation. Two days later, Dr. Lehn was informed by an aide that ISA had to have the technical analysis from Research and Engineering by the end of the day, May 25, 1978.¹⁸

Dr. Lehn prepared a memorandum, including a summary of the Army expert's position, and their own

recommendation for denial. This memorandum then went for informal review to Col. John Hager, who was the acting director of the Office of Technology Export in Research and Engineering.¹⁹ On the basis of his knowledge of the Soviet state of the art for military applications of tungsten carbide technology, Col. Hager felt that there would be no significant transfer of technology with military use, so he suggested that the denial would be inappropriate and without credibility. U.S. tungsten carbide armor penetrating technology is based on German technology obtained at the end of World War II. Factors in the decision included Soviet overall military requirements and logistics. "There was more than straight technology involved," according to Col. Hager.²⁰

The memorandum without recommendation for approval or denial was delivered to ISA on May 25, 1978, and ISA informed the Department of Commerce that there were no objections to issuing the license based on national security.²¹

A staff member of the Senate Permanent Subcommittee on Investigations said, during the inquiry into the Dresser case, that it was shown that Dresser and the Department of Commerce had contacted ISA officials several

times in the period from May 22 to May 30, 1978, to ask that the Department of Defense complete their review quickly. Such requests are not unusual, say Commerce and Defense Department officials. The Senate investigator also indicated that the Export Administration Act sets time requirements for completion of export applications, which are usually 90 days. The ninetieth day for the Dresser application was May 17, 1978.²² The Senate investigator said that the contemporary documentary record of the Dresser case offered no rationale for the negative recommendation by Research and Engineering, and no rationale for ISA's concurrence in the approval of the license. The investigator explained that these answers were sought in interviews with the personnel involved, but the interviews had not been completed, so he could only summarize what had come to light and point to the matters that seemed significant. There are apparently two significant points according to the testimony of the Senate investigator during the hearing.²³ The record of the testimony is given hereunder.

First, as to Research and Engineering: Colonel Hager advised us that he instructed that the proposed negative Research and Engineering recommendation be deleted because he did not believe that the possibility of diversion to a military use

necessarily supported a recommendation that the license be denied.

Although not a metallurgist or manufacturing expert, he was aware that tungsten carbide metallurgy for penetrators is not an advanced technology; that the Russians already have such penetrators; and that the Russians have the capability for tungsten carbide production for rock bit inserts. He cited as a further basis advice he received from ISA that the rock bit plant was "legitimate"--that is, the Russians needed bits for oil production and presumably would not divert the plant to military uses. He was also told that ISA did not need a recommendation from Research and Engineering.

Second, as to ISA: Dr. Ellen Frost, the Deputy Assistant Secretary of Defense of ISA, who supervises the office which coordinates export application reviews, advised that she did not believe a denial was warranted primarily because tungsten carbide technology for both penetrators and rock bit inserts appeared to be available within the Soviet Union and from foreign sources as well.²⁴

The Dresser case points up the complexity of technology transfer. The problem of no coherent policy, as pointed out by J. Fred Bucy, is evident, as is the lack of policy objectives, simplified criteria, and the "more pragmatic approach"--all called for by Bucy.

CHAPTER VI

STUDENT EXCHANGES

The Soviets are not inclined to be bashful about obtaining the high technology they want. If it can be obtained through training rather than purchase of techniques and machines, they will pursue that avenue. The training of graduate-level scientists and engineers at U.S. research institutes and universities continues in full force in the wake of the Soviet invasion of Afghanistan.¹

Student and scholar exchanges are conducted through four programs: interacademy exchanges, bilateral agreement exchanges, the exchange programs of the International Research and Exchanges Board (IREX), and the Council for the International Exchange of Scholars (CIES). A large portion of the student exchange is conducted through IREX, which has contact offices at leading universities and colleges across the United States. IREX really makes a serious effort to interest U.S. technical and scientific students in going to the Soviet Union for study, but with no success, according to a State Department

official. He explained that U.S. students do not want to learn Russian, live under conditions not as modern as in the United States, and have their travel and other aspects of everyday life controlled only to study in the Soviet Union, which is generally behind the United States from a technical point of view in the areas that would be available to a U.S. science student. He added that in some areas they lead, but generally they do not, and their laboratories are usually not so modern or as well equipped as similar ones in the United States. The State Department does have the right of approval of Soviet students who come to the United States, and regularly blocks entries or strongly recommends a change in the place of study of Soviet applicants for a variety of reasons.²

Through U.S.-U.S.S.R. academic exchange programs, mostly funded by the host government, Soviet students come to the United States to learn firsthand the critical technology and engineering aspects of the scientific processes. In many cases, the specific areas of study have dual application in the Soviet Union; the technology may be used in peaceful or military applications. On their return to the Soviet Union, some of the students work

directly on defense programs. It is difficult to determine the types of work most of them return to when they have completed their program in the United States, because they disappear from open research programs; it is thus believed that significantly more students are employed in military work than is known.³

The exchanges began in the late 1950s with few restrictions, and have continued with limited constraints. There are about 70 students from each country. More than half, about 40 from each side, are participants in the U.S.-U.S.S.R. graduate student/young faculty program for exchange. In this 10-month program, the participants stay at a research facility or university. About 10 of the participants are senior research scholars, and 15 to 20 are in a program conducted by the Soviet Academy of Sciences, which concentrates on social sciences and economics.⁴

The most significant aspect of the entire exchange program is the disparity of research subjects in the senior researcher and graduate student/young faculty programs. For example, in the 1978-79 academic year, all 10 U.S. senior research scholars worked in the liberal arts or social sciences. The same disparity exists for the

graduate students. All of the U.S. graduate students studied the liberal arts, literature, history, or music. Thirty-six of the 43 Soviet students focused on the sciences, particularly chemistry and physics.⁵

When compared with the topics pursued by the Soviets, some of the subjects studied by Americans seem almost ludicrous. Here are some representative samples from the 1978-79 school year:

Bruce F. Adams, 10 months at the Moscow State University, Russian Criminology, 1880-1917--An Intellectual and Practical History;

Bonnie C. Carey, 10 months at the Moscow State University, The Heroine in the Russian Fairy Tale;

Ellon D. Carpenter, 10 months at the Moscow P. I. Chaikovsky State Conservatory, Russian Music Theory in the Soviet Union--Its Historical Bases, Intellectual Traditions, and Current Manifestations;

George Cheron, 10 months at the Moscow State University, Mikhael Kuzmin and Russian Drama, 1906-1936;

Edith W. Clowes, 10 months at the Moscow State University, Friedrich Nietzsche in Russia, 1890-1910;

Richard A. Crecco, 10 months at the Institute of History of the U.S.S.R., Academy of Sciences of the

U.S.S.R., and Leningrad State University, The Formation and Social Characteristics of the Working Class in Russia --the Southern and Ural Regions, 1880-1914.⁶

These examples of the locations and topics of study activities by the American students are fairly representative of all the other U.S. participants during the 1978-79 academic year. All U.S. students went to either Moscow or Leningrad, and most studied soft and non-scientific areas at either the Moscow State University or the Leningrad State University. Only a few other Soviet institutions were involved, and all of them were in Moscow or Leningrad. U.S. students did not study at other locations.⁷ It is unusual, if not significant, that an analysis of the time periods of the topics studied nearly always precedes the 1917 Soviet Revolution. Even though all of the topics were nonscientific and centered on the arts, music, literature, or history, only a few U.S. students studied in the post-Revolutionary time frame, and then in an area like Kuzmin and Russian drama up to 1936!⁸

On the other hand, Soviet student visitors to the United States attend prestigious institutions of higher learning that sound like a roll call of the

top-ranking universities in the nation. The listing of states where this study is conducted is encompassing. Here are a few examples from the same school year as that mentioned above for the U.S. students:

Ali Akhmedov, University of Wisconsin, Problems of Completeness and Expansion of Eigen and Adjoint Elements in Compact Operators Depending on Spectral and Perturbation Parameters;

Yelena Andrunas, University of Pennsylvania, Concentration and Technology in Mass Media in the United States;

Marat Arslanov, Department of Mathematics, University of Illinois, Recursive Function Theory;

Vytautas Barzdaitis, University of California, Dynamics of Stepping Motors--System Dynamics;

Vladimir Batyuk, Massachusetts Institute of Technology, Structural and Dynamic Studies of Chemical Solid Systems;

Yuri Belkin, University of California. Application of Computer Graphic Systems to Automated Ship Design and Problems of Nonstationary Ship Hydrodynamics.⁹

All of these examples are from the 1978-79 U.S.-U.S.S.R. Graduate Student/Young Faculty Exchange program.

In both cases, in an attempt to be fair in the selection of the examples, the first six students from each list were indicated above. Generally, they are representative of the others. The U.S. students work in the arts and are confined to Moscow and Leningrad, while the Soviet students focus on the sciences at all of the major schools throughout the nation.¹⁰

Among the topics of conspicuous interest to the Soviet armed forces, which were the subjects of study of many Soviet graduate students and young faculty are: aircraft engine design, ship hydrodynamics, and optical-signal processing. These are representative of the advanced state-of-the-art topics studied by the Soviets in the United States. In current years, the Soviets have been aggressively seeking more access to U.S. computer technology than ever before through student exchange programs.¹¹

It is highly significant that, while working in scientific laboratories in the United States, many Soviet students will have access to and use of high technology equipment banned for sale or transport to the Soviet Union because of its high technology sensitivity. Specifically, this is equipment that cannot be sold to the Soviet Union

because it would damage the national security of the United States. Use by Soviet students of such equipment while studying in the United States to a large extent obliterates the effectiveness of the embargo on sales to the U.S.S.R. Also, the Soviets gain significant insight into the spectrum of U.S. scientific priorities, failures, and successes, so they can produce counter-programs through selective emphasis in the Soviet Union.¹²

There are reasons for the differences between the types of topics studied by the Soviets and the Americans. U.S. students of the sciences prefer to stay in the United States, where they can work with superior equipment and staffs, rather than travel to the Soviet Union and work under scientifically less developed circumstances. For U.S. participants, application is a matter of their choice; there is no encouragement by the U.S. government for any student to go to the Soviet Union or to study a specific subject. This is not the case in the Soviet Union.¹³

The Soviet government analyzes its scientific capabilities, determines any areas which constitute voids or gaps, and then selects specific students to take part in the student exchange program in an attempt

to fill the void of scientific knowledge in the Soviet Union.¹⁴

One fascinating facet of the student exchange program concerns U.S. government contracts to universities for research on militarily significant high technology projects. Various offices of the Department of Defense issue contracts to universities for research with potential military significance. These research projects may continue for a period of years before they are officially accepted and sponsored by a Department of Defense office. It seems foolish to allow highly educated scientists from the Soviet Union free run in the finest U.S. research laboratories, where university-sponsored and funded research projects may be in operation in preparation for sponsorship by a Department of Defense office. In more than one instance, it has been discovered that a research assistant working on a Department of Defense contract research project was in fact a Soviet exchange student.¹⁵

To call the Soviet representatives "students" is similar to looking the other way while the bandits rob the bank, and then stopping traffic so the getaway car can make a successful escape. According to Representative Paul Findley's article in the Congressional Record,

The Soviet "students" are far older than their American counterparts. Usually, they are at least 35 and already extremely experienced in their field."¹⁶ The academic and professional credentials listed for the 1978-79 Soviet participants reads like a credentials list of one of the finest graduate schools in the United States, with an outstanding college of engineering and science. The credentials for the six Soviet students listed earlier in this section are as follows:

Akhmedov, Candidate of Sciences in Mathematics, Department of Mechanics and Mathematics, Faculty of the Theory of Functions and Functional Analysis, Aserbaidzhan State University;

Andrunas, Candidate of Historical Sciences, Faculty of Journalism, Moscow State University;

Arslanov, Candidate of Physical and Mathematical Sciences, Docent, Department of Theoretical Cybernetics, Kazan State University;

Barzdaitis, Candidate of Technical Sciences, Assistant, Department of Mechanical Engineering, Kaunas Polytechnic Institute;

Batyuk, Candidate of Chemical Sciences, Senior Scientific Worker, Faculty of Chemistry, Moscow State University;

Belkin, Candidate of Technical Sciences, Docent, Department of Ship Hydrodynamics, Leningrad Shipbuilding Institute.¹⁷

The educational achievement termed "Candidate" in the Soviet Union is the equivalent of a master's degree from a top-ranked U.S. university, according to Soviet expert Dr. Kenneth R. Whiting, Documentary Research Directorate, Institute for Professional Development, Air University. He said there are relatively few Ph.D.s in the Soviet Union because the requirements are far more stringent than in other countries. He explained that a candidate is a person with substantial academic achievement.¹⁸

Using data from 1969, the Great Soviet Encyclopedia indicates that, of the 30,000 scientific workers engaged in the institutions of the Academy of Sciences of the Union of Soviet Socialist Republics (AN SSR), 2,000 were doctors of science and 12,000 were candidates of science.¹⁹ In 1981, the Soviets stated that there were 1.4 million scientific workers in the Soviet Union.²⁰ The AN SSR is made up of the most outstanding scholars in the U.S.S.R., and it is responsible for scientific direction over research on the most important studies on social

and natural sciences in the Soviet Union. The Council of Ministers of the U.S.S.R. directly controls the AN SSR.²¹

Representative Findley expressed serious concern over the student exchange program in the House of Representatives when he said that the federally funded U.S.-U.S.S.R. academic-exchange program,

. . . is enabling Soviet citizens to come to this country to acquire critical technological know-how and understanding of vital scientific processes. Much of what these Soviet scientists and engineers study here has a dual-use potential; that is, it has military as well as peaceful applications.²²

How is this one-sided drain of U.S. technology which has military significance to the Soviet Union to be halted? Representative Findley has studied the problem extensively, and proposes these answers. First, the United States has to insist on mutuality so that the United States will not be training Soviet "students" in the sciences while U.S. students are researching eighteenth century Russian history. Representative Findley says, "The United States must put an end to this one-sided flow--an outflow--of U.S. technology."²³

His second point is that now the national security risk of each proposed Soviet student and his topic are reviewed by an intergovernmental committee, which makes

recommendations on each Soviet applicant, based on his proposed topic of study and its U.S.-security implications. The recommendation is not directive in nature, and the State Department accepts the recommendation only as an advisory opinion which is frequently overruled. Representative Findley wants the committee recommendation to be binding, and the final decision on whether or not to admit a Soviet student for study in the United States to be up to the Department of Defense rather than the Department of State. He feels that the State Department does not have the technical background and expertise to judge properly the potential or actual national security risks of technology transfer. He feels that the required level of expertise lies in the Department of Defense. He also stresses that the role of the State Department is one of promoting international goodwill and good relations, sometimes emphasizing these objectives above all others. National-security interests must be the determining factor, and Findley goes on record that it is the Department of Defense which is most qualified to assure safeguarding those interests.²⁴

Representative Findley's third point, and a very interesting one, is that the same Department of Defense

office should review and decide on the student visitors and, with participation from the U.S. intelligence community, analyze and develop information on Soviet scientific and technological gaps and priorities. In part, this would be accomplished by studying the proposed studies and their areas of interest. If the Soviets knew such analysis were being conducted, it would deter them from seeking information in some critical areas because they would not want their interest known. Proposed study subjects would be analyzed to determine more about the Soviet scientific objectives. He feels that the United States should not ". . . help Moscow overcome its technological and scientific disadvantages and further undermine the U.S.-U.S.S.R. strategic balance."²⁵

These proposed changes may result in constraints to the point that the Soviets would want to end the exchange program. Or, in the words of Representative Findley,

Future Soviet students in the United States will spend 10 months researching topics such as "The Importance of the American Comic Strip as an Indicator of Social Change in the United States."

He feels that there is a need for understanding between the two countries but in the areas of humanitarian

programs, medicine, or cultural affairs. He is not in favor of transfer of military technology from the United States to the Soviet Union. He adds,

In the aftermath of the Soviet invasion of Afghanistan, we should clearly recognize the need for a strong U.S. national defense rather than Soviet goodwill.²⁶

Shortly after the Soviet invasion of Afghanistan, President Carter stopped major exchange programs between the U.S.S.R. and the United States, except for those associated with health topics. He also said that, if there were an overwhelming advantage to the United States, then that exchange could continue. To keep the communications open for a possible return to more normal exchange programs, Carter said that written communication relative to established contacts between U.S. and Soviet scientists could continue on a limited basis.²⁷

CHAPTER VII
THE FBI AND ITS ROLE

It was Senator Henry Jackson who said that the Soviets will steal what they cannot buy in the way of technology,¹ and a recent story by United Press International (UPI) quoting FBI director William Webster bears out that assertion.² Here is the story:

UPI26 - RW (WEBSTER) (BY GREGORY GORDON)

WASHINGTON (UPI)--FBI DIRECTOR WILLIAM WEBSTER SAYS THE SOVIETS AND CHINESE APPEAR TO BE STEPPING UP EFFORTS TO STEAL U.S. INDUSTRIAL TECHNOLOGY SUCH AS SECRETS ON LASER DEVICES, MICROBIOLOGY, AND MICRO-ELECTRONICS.

BUT WEBSTER SAID IN A UPI INTERVIEW MONDAY THAT, WHILE THE EFFORTS ARE INCREASING, THE FBI IS MAKING PROGRESS IN DETECTING COMMUNIST ATTEMPTS TO "CART OFF, BY DIPLOMATIC POUCH AND OTHERWISE, INDUSTRIAL TECHNOLOGY THAT TRANSCENDS MERE MILITARY SECRETS.

WEBSTER, WHO EXPRESSED CONCERN ABOUT THE PROBLEM TWO YEARS AGO, SAID, "THE EFFORT, IF ANYTHING, HAS BEEN INCREASED" BOTH BY THE SOVIETS AND THE CHINESE.

"I THINK IT'S ONE OF THE MORE SERIOUS PROBLEMS, BECAUSE OF THE DAMAGE IT CAN DO TO OUR NATIONAL SECURITY," HE SAID. "IN TERMS OF MANPOWER, WE'RE OUTMANNED AROUND THE WORLD BY OUR COMPETITION, BUT IN TECHNOLOGY, WE MAINTAIN A SUPERIORITY THAT COULD DISAPPEAR IF IT'S ERODED.

[The report continues for a number of paragraphs and signs: "UPI 12-16-80 06:01 PES".]³

Where are they? Where are those Soviet and Chinese

operatives who are seeking the U.S. technology any way they can get it? For the most part, the FBI director would be hard-pressed to say. The United States is an open society without internal controls on travel and without a national internal passport or identification system. When a soviet trade delegation comes to the United States (with visas granted by the Department of State), the members are relatively free to travel where they wish. Of course, there are a number of restricted areas in the United States where travel by Soviet, United Nations, embassy and consulate members is forbidden. For trade delegations, students, and other "visitors," there is no one checking to see where they go. When a Soviet freighter enters the Port of Tampa, the captain goes through the formalities, but while the vessel is being loaded during the next several days, no one watches which crew members leave but do not return to the ship, and which noncrew member walks aboard but does not come off before the ship sails. Where are all the Soviets, Hungarians, Romanians, Czechs, Poles, East Germans, Bulgarians, and Ukranians who legally enter the United States for a multitude of valid reasons each year and travel almost without restriction? Only a few are

observed, and then only because they are the most highly suspect. For the most part, we do not know their backgrounds, where they are, or what they are doing.

FBI director Webster says that the focus of communist intelligence operatives is on control devices, microelectronics, microbiology, and lasers. But he adds, "It is by no means limited to these areas." Through an FBI and industry program, he said, there have been some breakthroughs to discover the methods used by the Soviets to steal or otherwise obtain secret information from U.S. industrial firms.⁴ The FBI has informed companies about Soviet and Chinese efforts to get their employees to provide government or company secrets. Webster said that some foreign diplomats who had engaged in this activity had been expelled from the United States after they were declared persona non grata by the State Department.⁵ In February 1980, FBI Intelligence Chief William Cregar, at the time of his retirement, said that five diplomats from Warsaw Pact countries had been expelled for spying activities by the administration.⁶ Where are they? Where are their surrogates? Do we know?

CHAPTER VIII

THE DEPARTMENT OF COMMERCE

"Oh, my God! Did he enter it in the record?"

That is what Don Landa of the Department of Commerce asked when a news reporter told him that Representative John Ashbrook had a secret internal Department of Commerce document describing illegal technology transfer to the Soviet Union.¹ Landa continued, "My reaction to that is that I'll have to hold off any comment as a spokesman for the department."²

Representative Ashbrook had obtained the Department of Commerce document through unofficial and informal channels and then entered it into the Congressional Record of March 12, 1980. The statements in the Congressional Record read like an indictment of foreign agents who were trying to subvert the federal government. Representative Ashbrook described the document as the "most incredible" he had encountered for some time. He continued,

This document, which surfaced from the bowels of the bureaucracy of the Commerce Department, outlines better than any other one document the methods by which American technology flows to the war lords of the Kremlin.³

However,

What is even more incredible about this document is the fact that it existed in the bureaucracy as early as 1978. This means that at the time administration officials were testifying before congressional committees that there was no illegal diversion of American technology taking place, there was, in fact, hard evidence of just such activities occurring. This evidence was sitting right on the desks of the very people who were saying there was no evidence.⁴

Members of Congress, industry leaders, present and former employees of the Department of Commerce, all had accused the Department of ignoring the national security and defense needs of the nation and putting business interests first. Representative Ashbrook commented,

The covering up of valuable information such as that contained in this document represents an act of great dishonor to our nation's best interests. Those in and out of government who opt for short-term profits in light of the impact of technology transfers either refuse to confront reality or exercise gross irresponsibility.⁵

Ashbrook said that the document is tragic in that it discusses illegal diversion of technology which only serves as a tool for the Soviet Union and its satellites to expand their capability to disrupt the free world. He issued a challenge to remove those from government service who were involved in the coverup of the document from Congress for more than two years.⁶

Specifically, the secret Department of Commerce document describes illegal shipments of embargoed high-technology equipment through third countries from U.S. manufacturers and ultimately to the Soviet Union. Here are some examples of the cases cited in the document. Texas Instruments digital equipment and sensitive magnetic recorders in 1974 were exported ". . . without the requisite license by placing it on a Polish vessel under charter to a Norwegian company." The report continued, "The equipment was transported to Poland and installed on a Norwegian vessel. The latter vessel, reportedly, was subsequently sold to the U.S.S.R."⁷

Computers and related equipment manufactured by General Automation, Inc., was ". . . exported under a U.S. firm's distribution license to its subsidiary in the U.K.," which built the U.S. equipment into its own equipment and then reexported it to Hungary. In still other examples, the equipment was exported to the U.K. subsidiary which then exported the computers with a demonstration license to the Soviet Union "for an exhibition."⁸

Hewlett-Packard analyzers and sophisticated electronic test equipment were provided to a West German national, ". . . knowing the intended illegal disposition."⁹

Technical information on integrated circuits manufactured by Intel was "hand-carried to Austria" with the correct license and diverted from there for Soviet use. Intel is one of the largest and most sophisticated electronics manufacturers in the United States.¹⁰

Senator Harry F. Byrd, Jr., while on the floor of the Senate discussing the Department of Commerce document, entered into the Congressional Record by Representative Ashbrook, said,

The process of turning over wholesale to Russia and the Warsaw Pact nations advanced technology developed at great expense in the West should not be permitted to continue, notwithstanding profits earned by American and West European corporations. I favor a total embargo on all trade with Russia and its military allies.¹¹

"The export control system, as it is today, is a total shambles," according to Larry Brady, former key official at the export office of the Department of Commerce. He continued by asserting that the safeguards written into the regulations are ". . . not worth the paper they're written on." As Brady explained it, the Soviets can purchase certain products if they will sign a statement that the product will not be used for military purposes in the Soviet Union. He said, "Otherwise, we wouldn't approve it." The question then becomes: Who

checks, or would the Soviets allow anyone to check, to see what the real use is?

Jack Anderson described it well, when he wrote,

There is no effective way to make sure the Soviets live up to their promise. Instead, the Commerce Department relies on the fox to guard the henhouse; on-site inspections are made by representatives of the U.S. companies that sold the products. Not only are these employees often non-Americans but they have a strong motive for ignoring any Soviet violations.¹²

Brady explained that the manufacturers want to continue to sell to the Soviet Union, but if a diversion to military use is reported, sales would be halted.¹²

Brady, while acting administrator of the Office of Export Administration,¹³ "blew the whistle" on Department of Commerce activities during a testimony before the House Armed Services Committee in July 1979.¹⁴ Brady explained the Kama River truck plant to the committee. He said that the plant was the world's largest, equipped with U.S. computers, machine tools, and process designs worth \$500 million. He stated that he had confirmed production of military vehicles and parts at the plant, and said, "The file indicates that we knew at the time the license was made . . . at the White House in 1974 . . . that they would manufacture more engines than trucks."

Another high official added, "Any reasonable individual knew then that the extra engines and other things would go to the military." The sale was approved in spite of these facts by Henry Kissinger, who was then Secretary of State.¹⁵

"For all practical purposes, when you export a computer, you lose control over it," Brady commented. The most heated controversies are over the export of U.S. computers. Brady provided background information by saying that there is "no real way" to know if a computer has been diverted for military application. In 1978, President Carter approved the sale of a U.S. plant with the capability of producing unique deep oil drilling bits,¹⁶ and the plant included a computer with the capability of controlling electron-beam welding equipment, which has nuclear and laser as well as aircraft production applications.¹⁷

Brady told the House Armed Services Committee of skeletons in the Department of Commerce closet just after Stanley Marcus, Brady's boss, had told the committee that everything was in good order in the area of safeguards for the export of technology to the Soviet Union. The day after Brady testified before the committee, he was called by

Marcus, who, according to Brady, was ". . . a little uptight with the remark I had made last night about safeguards." Brady, who was considered "very competent" before the testimony, was removed from his job as acting director of the Office of Export Administration. He was reassigned to the position of deputy director of the export control unit on the condition that he would not talk with Congress or news reporters unless he had prior approval of his superiors.¹⁸

Before the committee, Brady disclosed details on quasi-military use of the IBM computers at the Kama River plant. He said that, if he had the authority, he would remove the U.S. computer experts who were in the Soviet Union at the Kama River plant, and added that he would allow no more spare parts for IBM computers to be sent to the Soviet Union.¹⁹

Brady was harassed on the job by pro-trade superiors, and was finally forced to resign. His case was investigated by the Special Counsel on the Merit Systems Protestation Board, which determined that indeed Brady had been wronged and that the Department of Commerce restore his full responsibilities."²⁰

Brady's interview for Human Events, Brady said,

The Commerce Department refused to accept the Merit Board's recommendation, however. It fought them tooth and nail. And without the support of the President or the White House staff, I couldn't get my job back.

He was employed by the American Security Council's Coalition for Peace Through Strength in New Hampshire from early 1980²¹ until he was nominated by President Reagan to be assistant Secretary of Commerce for Trade Administration shortly after the new President took office in January 1981.²²

A column by Patrick J. Buchanan entitled "Whistle Blower's Happy Life," from the July 10, 1979, issue of the Manchester (NH) Union Leader, brings forth a damning indictment against President Carter and his feeling of full cooperation with the Soviets to the detriment of the national security of the United States.²³ Here is an excerpt from that column:

For doing his job, Brady was demoted. The position he held was turned over, without competition, to a more malleable bureaucrat. Brady anticipates a punitive transfer; and Washington has greeted his treatment with a yawn.

Indeed, following Brady's testimony--greeted with private encouragement from like-minded men at Defense and the National Security Council--President Carter proposed as ambassador to Moscow, Thomas I. Watson, former board chairman of IBM.

To our resident wit, Mark Russell, Watson is one of those Fortune 500 empty-heads who think Dr. Zhivago is a Bethesda dentist and whose qualifications

for the Moscow post consist of dozing through two performances of "Swan Lake."

But the jest is an understatement. Watson is a student of the Averell Harriman School of Diplomacy, a businessman cut from the same bolt of cloth as Armand Hammer. He appears to hold to the tenet that capitalist-communist trade advances mutual understanding. Some of us are rather more concerned that on the other side of those "bridges" we are building to Moscow sit 50,000 Russian tanks.

A president has a right to choose his own envoy. Yet, there is ground for alarm when a Larry Brady is effectively and quietly purged, while the White House elevates to ambassador to the Soviet Union a big businessman likely to turn Spasso House into a miniature American-Russian version of the Leipzig Trade Fair.

Watson should be put upon a Senate griddle before confirmation. The American people, shelling out 5 percent of GNP for defense against the Soviet Union, have a right to know what his company's computer is doing at Kama River, and what he thinks State and IBM should do about it.²⁴

In light of this editorial comment, it is interesting to observe another perspective, this one from a representative of industry. "I would say where the [military-related] technology is available to the Soviet Union anyway, we may as well think first and foremost of our economic health and we may as well get the benefit of selling to them," says Dr. J. E. Goldman, chief scientist and head of Corporate Research Centers, Xerox Corporation.²⁵

President Carter, in early 1980, announced measures against the Soviet Union in reaction to its invasion

of Afghanistan during the preceding month. Among the measures was a ban of export of all high-technology materials to the Soviet Union. About 900 export licenses, already validated, were suspended, and about 350 applications in the system were halted. But military-related items not on the Commodity Control List and general export items still continued on their way to the Soviets.²⁶ The President's action was attacked as insufficient, and the argument on military significance was started again.²⁷

By mid-March 1980, President Carter had lifted the ban on export, roughly two and one half months after the Soviets invaded Afghanistan. There are some who feel it was in response to fierce pressure from business. When the President lifted the ban, he claimed that every license application would be reviewed with tough new criteria. Department of Commerce officials declined to explain the tough new criteria, and in the Congress and elsewhere charges were raised that the President had simply authorized a return to business as usual with the Soviets.²⁸

A Senate investigator said, "It's a case of bankrupt foreign policy." Another source close to the Senate said, "The Administration just responds in a knee-jerk

fashion to events, and really doesn't take the lead."

The fog surrounding which items are exportable to the Soviets continued.²⁹

Senator Jackson clarified the problem when he said,

The flaws in our export controls are due to an absence of conviction, not resources; it is within our capacity and that of our allies to remedy them. But the time is long overdue to translate rhetoric about our tough, new policy into effective action.³⁰

At the time Representative Ashbrook uncovered the internal secret document from the Department of Commerce that explained in blatant detail the diversion of critical technology to the Soviet Union, Don Furtado, deputy under-secretary of Commerce for Trade Administration, said that illegal diversion is ". . . probably less significant than one might think."³¹ To the contrary, said Senator Gordon Humphrey, "Because of these and other clandestine acquisitions, the damage done to our national security is inestimable."³² "My God, let us not put the Secretary of Commerce in charge of the defense of this nation," warned Representative Richard H. Ichord, on the export of critical military technology.³³

CHAPTER IX

THE NATIONAL TECHNICAL INFORMATION SERVICE

Part of the mission of the National Technical Information Service (NTIS), as directed by Public Law 81-776, is to make the results of technological research and development more readily available to industry and business, and to the general public, ". . . as a clearinghouse for technical information which is useful to American industry and business." The public law, approved in late 1950, directs the Secretary of Commerce to operate a clearinghouse for scientific, technical, and engineering information (ST&E).² This is accomplished through NTIS, which is located in Springfield, Virginia.³

NTIS has done a magnificent job of collecting studies, reports, and documents concerning ST&E topics from a wide variety of sources. The service collects documents from all branches of the federal government as well as state and local governments. In a study done by the General Accounting Office in 1975, it was determined that the Energy Research and Development Agency, Department of

Defense, and National Aeronautics and Space Administration, provided nearly all of the ST&E documents to NTIS. The report also stated that the Departments of Agriculture and Labor were furnishing only a limited number of the total ST&E documents produced by those agencies. Concern was expressed over funds and duplication, as well as disadvantages of a decentralized operation from the user's point of view. It was also noted in the study of NTIS operations that the following entities were not submitting all of their ST&E documents to NTIS:⁴

Department of Labor

Bureau of Labor Statistics

Department of Health, Education, and Welfare

Department of Housing and Urban Development

General Services Administration

Securities and Exchange Commission.

What does the NTIS do with the documents, and how do its activities interest the Soviets from the technology-transfer point of view? All of the documents held by NTIS are for sale. During the three years ending 1978, NTIS added more than 210,000 documents. The number of documents added to the system increased by more than 1,500 documents each year from 1971 to 1975 but rose by nearly

20,000 documents during 1977.⁵ The total number of titles available in 1980 was more than one million.⁶

Through a variety of access systems--some computerized such as NTISearch--abstracts of interest from among the 360,000 reports on federally-funded research projects are available almost instantly. Through the Smithsonian Science Information Exchange, abstracts on 200,000 continuing research projects are computer-retrievable by using NTIS. Paper copies or microfiches are available of the complete reports at nominal cost.⁷ For those who want more information directly available, there is the NTIS Bibliographic Data File. This file, on magnetic tape, encompasses unpublished as well as published abstracts, and can be leased.⁸

NTIS serves as the marketing coordinator for a number of U.S. information analysis centers for publications, abstracts, special analyses, and technical inquiries. It has working relations with the Domestic and International Business Administration (DIBA), a part of the Department of Commerce. DIBA provides computer-retrievable information for small businesses that do not have sufficient demand for their own system. Through a Department of Commerce field office, the small business

can obtain a search through NTIS by using several accessible data bases. The experimental custom research program is conducted by a specially-trained representative at Department of Commerce field offices.⁹

In conjunction with the American Petroleum Institute (API), NTIS operates a unique information program. It concentrates on producing and publishing subject searches. The API operation is similar to one established in 1976 for a special information program with Engineering Index, Inc.¹⁰

NTIS publishes topical directories to make its service more available. In 1977, three computer directories were issued. The directories are part of a continuing program, and they discuss such topics as Environment, Minicomputers and Microcomputers, and Energy. The purpose is to inform scientists, systems analysts, and programmers about the most current applications of computer software in the specific categories. A number of directories were planned, to cover such subjects as Civil and Structural Engineering, Medicine, and Physics.¹¹

Several years ago, NTIS started a new service which provides access to 5,000 journals through cooperation with the National Commission on New Technological

Uses of Copyrighted Work (CONTU). NTIS acts as a relay point for orders for copies of articles from publishers, libraries, and information centers. NTIS said that the following design goals were met during a demonstration:

1. Central access to a network of major journal holdings;
2. Rapid article copy delivery;
3. Automated accounting as part of the regular NTIS deposit account service;
4. Guaranteed copyright license on all article copies delivered.

All the activities of NTIS are not limited to operations in the United States. As of June 1977, foreign managing dealers had been established to serve the United Kingdom, the Republic of Ireland, France, Switzerland, Belgium, Japan, and the Netherlands. It was anticipated that this service would be further expanded. The purpose is to provide documents to foreign customers.¹³

The Soviet Union and NTIS have worked together to insure that the United States exercises good faith and adheres to copyright laws on material produced by the Soviets, as well as broader distribution of Soviet copyright materials in the United States. NTIS executed an

encompassing copyright license agreement to allow it to sell:

1. English translations of articles in about 500 Soviet scientific and technical journals, and
2. Cover-to-cover English translations of a number of Soviet journals.¹⁴

The agreements involved payments of royalties by NTIS to the Copyright Agency of the Soviet Union. An NTIS report said, "NTIS has developed a close working relationship with [the Copyright Agency of the Soviet Union] and expects that this will result in additional copyright licenses which afford NTIS customers greater access to current Soviet technical publications." There was no indication in the report of any type of reciprocity, or that a similar royalty program had been or would be established with the Soviet Union for payments to NTIS of royalties to U.S. authors and publications.¹⁵

An analyst of the CIA said,

The NTIS is a spotting service for the Soviets. They use it to filter out all the uninteresting scientific and technical information published through the federal government. They especially look at the contractor's reports on military research and development projects. Copies are available on microfiche.¹⁶

The Soviets were subscribers to the NTIS Selected

Research in Microfiche (SRIM) until President Carter directed that they be dropped after the Soviet invasion of Afghanistan. Warsaw Pact nations may continue to subscribe, as well as any number of organizations in the United States under contract to buy for the Soviets. This amounts to the establishment of "front" organizations for Soviets.¹⁷ The NTIS describes SRIM in this manner: "Standing order service automatically disseminates full texts of research reports (in microfiche) specially selected to satisfy individual requirements."¹⁸

Senator Henry Jackson's quote concerning transfer of technology from the United States to the Soviet Union would be fitting here. "[The Carter administration has behaved] like a brain-damaged spider caught in its own web, unable to extricate itself."¹⁹

CHAPTER X

ARE THERE ANY ANSWERS?

It is obvious that technology transfer to the Soviet Union is a matter of the utmost consequence to the nation. Hundreds of news stories are published each year warning of the critical nature of the problem. On the floor of Congress, the problems is discussed frequently with all its dire consequences. The Department of Defense showed great concern when it commissioned the Task Force on Export of U.S. Technology, and asked chairman J. Fred Bucy to examine the problem and make recommendations. Even the Soviet defector, Dr. Anatoly Fedoseyev, who was quoted extensively earlier in this study, discussed solutions. In a statement to support Senator Jake Garn's proposed Office of Strategic Trade, Dr. Fedoseyev said,

It is absolutely impossible to struggle with such a system of technology transfer by means of the decentralized system of responsibility and lines of decision-making existing in the United States. A central organization in the United States would be required.¹

Dr. Fedoseyev was a user of U.S. technology for a

number of years while he was a scientist in the Soviet Union. There he had responsibilities for, among other jobs, protection of Soviet technology. In the same statement noted above, he discusses obtaining U.S. technology and protecting Soviet technology.

The highly organized and greatly centralized military-technical machinery of the U.S.S.R. is outstandingly effective in obtaining new U.S. and Western technology and in preventing the reverse process. Many times, advanced technology was requested for research, and it was provided.²

Two possible solutions are discussed here. One is a bill introduced by Senator Garn to establish an Office of Strategic Trade, and the other is a proposal by Colonel John Hager, who played a role in the Dresser case and has had many years of front-line experience in technology transfer. Senator Jake Garn of Utah, ranking minority member on the Senate Banking Committee during the 96th Congress, has been a leader in Congress to get more controls on trade to protect the U.S. technology lead, according to Senator John Warner of Virginia.³ Senator Garn has introduced a bill to centralize the technology protection functions now scattered, and place them in the Office of Strategic Trade, Senator Warner continued. He added that he supported the much-needed

legislation and urged his congressional colleagues to be aware of the problem by reading a news editorial he inserted into the Congressional Record.⁴

"I have lost faith in the Commerce Department to [control the flow of critical technology to the Soviets]," Senator Garn said in the spring of 1980, when commenting on the reaction of the Department of Commerce to President Carter's revised export guidelines following the Soviet invasion of Afghanistan. Senator Garn stated,

It appeared to me that the Commerce Department was attempting to fight a rearguard action to protect existing trade relations with the Soviet Union-- despite the obvious implications for U.S. national security.

The senator was directing his remarks to the problem of the Department of Commerce's continuing to approve the export of a 200-foot automated assembly line for use in manufacturing truck engines at the Soviet Kama River truck plant after President Carter embargoed that type of export. Senator Garn continued, "I am distressed that the decision to deny the sale was so belated. This means that only one of the many loopholes in the new guidelines has been closed."⁵

After a long and close study of the technology-transfer problem, Senator Garn introduced a bill to solve

the problem by establishing an Office of Strategic Trade. He says that the Department of Commerce, which now has the primary responsibility for general coordination and approval of export, including high technology, ". . . in its desire to increase U.S. exports, fails to weigh adequately the national security implications of any particular sale." He continues,

[The Office of Export Administration] has been treated as an unwanted stepchild by the Commerce Department. Over the past few years, the OEA has been deprived of the resources to do its job and its dedicated staff have been subjected to bureaucratic harassment from above, as noted in a recent report by the Office of the Special Counsel of the Merit Systems Protection Board.⁶

The senator said that the General Accounting Office had long recommended export licensing responsibilities be placed in one agency. The Office of Strategic Trade proposed by the Senator would provide this consolidation.⁷

The details of the proposed Office of Strategic Trade are as follows. The office would be headed by a director, who would be appointed for a two-year term by the President with approval of the Senate. In addition to the internal duties in the office, the director would chair the Interagency Operating Committee, which would be made up of representatives from the Departments of

Commerce, State, Defense, Energy, Treasury, the CIA, and NASA. The director of the Exporter Services Facility would act as liaison with the business community and see that questions from the public or interested persons would receive action. The deputy director for operations would conduct the licensing program and monitor conformity to directives. Compliance would be monitored by the deputy director of compliance, and his staff, which would make inspections and monitor overseas compliance. In the CoCom division lies the responsibility for technical positions on trade of military and strategic technology.⁸ The licensing division would handle all matters relating to the commodity control list, munitions control list, foreign policy control list, and short supply controls as well as licensing actions. The licensing division has a number of offices with specific responsibilities. They are: office of the operating committee, office of computer licensing, office of capital goods licensing, office of electronics, office of short supply licensing, office of munitions control, office of technological data, office of technology assessment, and the office of foreign policy controls.⁹ The fifth major function in the office would be the office of a general counsel.¹⁰

Specific transfers from other government operations would include matters relating to the following areas:

1. The Export Administration Act of 1979 from the Department of Commerce;
2. The Arms Export Control Act;
3. Physical inspection of exports not covered by the commodity control list from the customs service; and
4. Other functions determined by the director, in consultation with the director of the office of management and budget.¹¹

Senator Garn's proposal would solve the problem by concentrating forces and responsibilities into one organization. Another proposed solution would leave most responsibilities where they are but would strengthen the relations of those organizations, especially with other national governments.

Air Force Colonel John Hager, director, Critical Technologies Project in the office of the under-secretary of Defense for Research and Engineering, has been involved in technology transfer for a number of years and has developed his own program to prevent the flow of militarily critical technology to the Soviets, and at the same time

encourage the sale of noncritical technology by the United States and other businessmen from CoCom or Western countries. Col. Hager, a research and development engineer for more than half of his early Air Force career, holds a Ph.D. in economics and is sensitive to the need to protect militarily significant technology while at the same time promote trade with the Soviets to the greatest extent possible. His program has four key factors:

1. The need for a presidential decision on providing the Soviets with oil exploration and exploitation technology so they will be self-sufficient;
2. A realistic and workable west-to-west trade criterion and agreements;
3. A Universal Technologies List; and
4. Understanding and support of the academic community.¹²

There are similarities, linkages, or direct relationships between much of the militarily critical technology and oil exploration and exploitation technology. With a presidential decision as to the extent of U.S. support required to make the Soviets self-sufficient in oil, then the boundaries could be set for provision of technology that would not injure U.S. national security.¹³

West-to-west trade presents opportunities for

abuse of technology transfer. NATO nations, except Iceland but including Japan, make up the Coordinating Committee, which is known as CoCom. The purpose is to prevent transfer of critical military technology to the Soviets. In addition to the member nations, there are three others which are significant in technology transfer: Sweden, Switzerland, and Austria. There would have to be an arrangement whereby those three nations could join CoCom or be subscribing members without official membership.¹⁴ U.S. control of technology flow from those nations would be based on cooperation and incentives.

First, the Universal Technologies List would be provided to subscribers; this would eliminate most gray areas at the outset. The list would be developed from the Critical Technologies List, Munitions List, and Commodities Control List, and would serve as the authority for the United States as well as for subscribing nations.

Second, any questions for waivers or exceptions would be taken to CoCom for member nations or to the Department of Commerce for subscribing nations or U.S. businessmen. In its role as advocate for the request, The Department of Commerce would review the request with counsel from other federal government agencies. The

incentives to member and subscribing nations would be the provision of military-applicable technology to them for use internally at the outset, and internationally later on. The technology provided would first be in use in U.S. operational military units. This would provide a substantial savings in time and cost for the member or subscribing nation, and would assist its economy at the beginning and later if the nation started an export program of products using that technology. This system provides a time safeguard for current and critical technology of three to five years between U.S. deployment to operational units and possible acquisition by the Soviets.

Nations not cooperating would suffer from sanctions against technology transfer and military relations. One of the key factors for success in the member and subscribing nations would be to get the ministers of defense directly involved in the approval chain for exports from their country. In this way, a strong internal control would rest in each of the nations.¹⁵

It is important to point out that the best minds in the nation from the Department of Defense, the Department of Energy, the Department of Commerce, other federal agencies, business and industry, and the academic world,

work together to develop the Universal Technologies List. The list must have extraordinary credibility in the United States, as well as in CoCom and subscribing nations, if the program is to be effective.¹⁶

One aspect of technology transfer remains unresolved. In some of the leading academic research facilities, work is being conducted that could result in militarily significant technology to the Soviets. Nearly half of the research assistants and graduate students in these facilities are not U.S. citizens, and the potential exists for transfer of the technology to the Soviets. Much of the work is funded by the federal government. Such critical technologies as very high speed integrated circuits are among those research projects with substantial military application within the Soviet Union. Some of the research projects are so detailed that they are almost pilot plants. From a project such as this, it is possible to learn circuit design, system design, and go into full-scale production. There is little additional technology to transfer in order to establish the industry in the Soviet Union. The leaders in the academic community feel that scientific and academic freedom is important, and that the overall purposes of the country are not

best served by restricting scientific information and academic freedom.¹⁷

An important facet of this program is the education of the leaders in business and industry so they gain an understanding of the problem and learn how to work successfully within the exports limits on critical technology with military application by the Soviets.¹⁸

Another aspect of technology transfer involved the almost unchecked travel by Soviet visitors in this country. The Soviets could come to the United States to visit any city, stay any length of time, and in general do what they pleased. If they spent three months in Sunnyvale, California, attempting to collect information on the microelectronics developments there, the activity would probably go unnoticed unless they were very obvious about it.¹⁹

The following is an effective and economical program which would give a substantial measure of control on Soviet visitors. At present, Soviets must have a visa to visit the United States. If the State Department visa-issuing operation would inform The Department of Immigration and Naturalization, they would be aware of who is coming, when, and through which port of debarkation.

In most cases, the Soviet visitors would arrive at Kennedy International Airport in New York or Dulles International Airport in Washington, DC. On their visa application, the Soviets would be asked their itinerary and who they would be visiting, by date and location. These facts would be confirmed on arrival in the United States. If they did not depart as they had indicated, then on their departure they would be asked to explain the deviation in itinerary. This procedure is nothing compared to the control of foreign visitors in the Soviet Union, and thus should cause no difficulty with the Soviets. Through the use of a simple computer program, reasonable control over Soviet visitors could be achieved.²⁰

These are two suggested solutions to the overall problems of technology transfer, and a proposed answer to the problem of Soviet travel in the United States. It is possible that one may be implemented and be successful, and it is also possible that a totally new approach may evolve in the near future and be found to be the best possible solution. In any event, it is essential that an answer be found soon.

In what direction is the nation moving to find an answer, and is there a clear national policy on

technology transfer to the Soviet Union? The primary responsibility for management of exports and control of critical technology is still assigned to the Department of Commerce. With a new administration heading the nation, what are the plans of the Department of Commerce to correct a seemingly difficult problem?

Larry Brady, who was forced to resign from his position as deputy director of the Office of Export Administration in the Department of Commerce under the Carter administration, was recently named by President Reagan as assistance secretary of commerce for trade administration. Brady, in his job as assistant secretary, said,

We must come to grips with the morass of the export control system and the concentration of bodies and resources in areas that probably are not as important as some of the more neglected areas. I think this is the first time in a long time that the administration is going to develop a strategic trade policy. That, I think, is relatively significant.²¹

He indicated that it was too early for a definitive program because the administration is just coming to grips with where it wants to go. One of the critical problems, he felt, is the question of allies who are "commercial types" who resist efforts by the United States to strengthen controls to make them more effective.²²

Brady said he testified in favor of Senator Garn's bill for an Office of Strategic Trade but now has a different view. He said,

I would like to be given the chance to see if I could make the present system work. I think we probably can do it without having to create a new apparatus such as the Office of Strategic Trade.

He emphasized that the organization itself was not so important as the participants and their willingness to work together and achieve the objective. Brady added that he firmly believes that the key persons at the Department of State, the Department of Defense, and the National Security Council are the types of people who, working with him, will be successful in solving the technology transfer problem. "I think we have the possibility of making some real headway," he stressed.²³

Two aspects of the export control system--enforcement and education--will get emphasis, Brady said. "You can expect the U.S. government to focus a lot of attention on the enforcement apparatus, the compliance apparatus," he explained. He felt that a large-scale education program was necessary so industry leaders would understand the potential damage to the nation from the transfer of militarily significant technology. He added that

an analysis of export data would be developed and provided to industrial exporters. He said that they must face the realities of dealing with the Soviets, and that American businessmen see a market of millions in the Soviet Union and think they are going to get in there and clean up. He further noted that they sell a plant and that is the end of it, except for some spare parts and little followup because the Soviets are in production and may have become competitors in the international market.²⁴

Time is running out for the United States, and its last line of defense is its technological lead over the Soviets. Providing them with basic scientific research with military applications and selling them production capability for critical military technology will erode the thin lead in that last line of defense, until there is none. Then it will be too late for all of America to rise up and say, "Let's do something about the problem!" Now is the time to act.

CHAPTER XI

CONCLUSION

An integral part of the national defense strategy is the use of export controls because they can prevent the development of sophisticated equipment and thus discourage armed aggression against the United States. The keystone of deterrence is a sufficiently high level of military capability so that it will deter attack. Dr. Ellen L. Frost, deputy assistant secretary of defense, says that success is based on the performance of our "principal weapons." Thus, the United States' lead in high technology weapons systems over the Soviets is the foundation for a deterrence strategy.¹

The greatest risk is the transfer of know-how from the United States to the U.S.S.R., according to the Bucy Report. High-technology items must be protected, of course, but the "process that creates them" is even more vital.² Bucy explains:

Yet today that mastery of design and manufacturing is being rapidly transferred to friendly nations, to non-aligned nations, and to Warsaw Pact nations. Exporting design and manufacturing know-how to

potential economic competitors--friends or foes--strengthens them to compete against us for world markets. Yet we continue to transfer know-how by many means.³

Dr. Miles Costick of the Institute on Strategic Trade warns,

Over the past 10 years, the outflow of technology to the communist countries has dramatically increased. The amount of significant technology that has been transferred and its impact on the military capabilities of the communist countries, particularly the Soviet Union, is not exactly known.⁴

Dr. William J. Perry, under-secretary of defense for research and engineering, says the primary concern should be manufacturing and processing methods because it is there that the United States has the greatest lead, rather than in the scientific area. In spite of higher-quality weapons, he continues, export controls must halt the flow of dual-purpose commercial exports. Dr. Perry explains that dual-purpose commercial items have significant military applications. He says that semiconductors and computers are the vital factors that allow the United States to keep its lead over the Soviets. He recalled Chairman Brezhnev's statement that the Soviets will spend 75 percent more on research, development, and production of a military nature than the United States. Dr. Perry emphasized the point by looking at the five

years from about 1974 when the Soviets produced twice as many missiles, airplanes, and tanks as the United States.⁵

Dr. Edward J. Philbin, physicist, researcher, and a colonel in the Air Force Intelligence Reserve, reported in a study two years ago that,

The assumption of [high caliber Soviet scientific research capability] is further supported by the available evidence which indicates that Soviet scientific research programs and capabilities are in the approximate parity with those of the United States.⁶

He emphasized that the Soviets do not lack theoretical capabilities, experimental facilities, and inventive genius.⁶

Dr. Costick states that, rather than building the Soviets' interest in peace, the massive transfer of technology and capital from West to East has had the reverse effect. He warns that it was a tremendous contribution to their strategic capabilities and thus encouraged belligerence.⁷

The time is now for the United States to start acting on the advice of such leaders as J. Fred Bucz, Larry Brady, Col. John Hager, Senators Garn and Jackson, and Representatives Findley and Ashbrook. Now is the time to stop talking and start acting, before it is too late.

It is essential that the flow of critical technology to the Soviet Union be halted. Recommendations brought forth in this paper from various experts in the field must be evaluated, consolidated, and orchestrated into an effective program which will permit quick approval of noncritical exports but stop the flow of critical technology.

CHAPTER XII

EPILOGUE

Aleksandr Solzhenitsyn provides a thoughtful conclusion to this review of technology transfer to the Soviet Union. While speaking to the AFL-CIO during the summer of 1975, he related the following conversation between Lenin and Karl Radek.¹

I must say that Lenin foretold this whole process. Lenin, who spent most of his life in the West and not in Russia, who knew the West much better than Russia, always wrote and said that the Western capitalists would do anything to strengthen the economy of the U.S.S.R. They will compete with each other to sell us goods cheaper and sell them quicker, so that the Soviets will buy from one rather than from the other. He said, "They will bring it themselves without thinking about their future." And, in a difficult moment, at a party meeting in Moscow, he said, "Comrades, don't panic; when things go very hard for us, we will give a rope to the bourgeoisie, and the bourgeoisie will hang itself."

Then Karl Radek, . . . who was a very resourceful wit, said, "Vladimir Ilyich, but where are we going to get enough rope to hang the whole bourgeoisie?" Lenin effortlessly replied, "They'll supply us with it."²

"The Russians must think we're a bunch of saps," said Senator Henry Jackson.³

APPENDIX A
DEPARTMENT OF DEFENSE
INTERNATIONAL BUSINESS POLICY

Washington International Business Report -
An Analytical Review and Outlook on Major Government Developments
Impacting International Trade and Investment

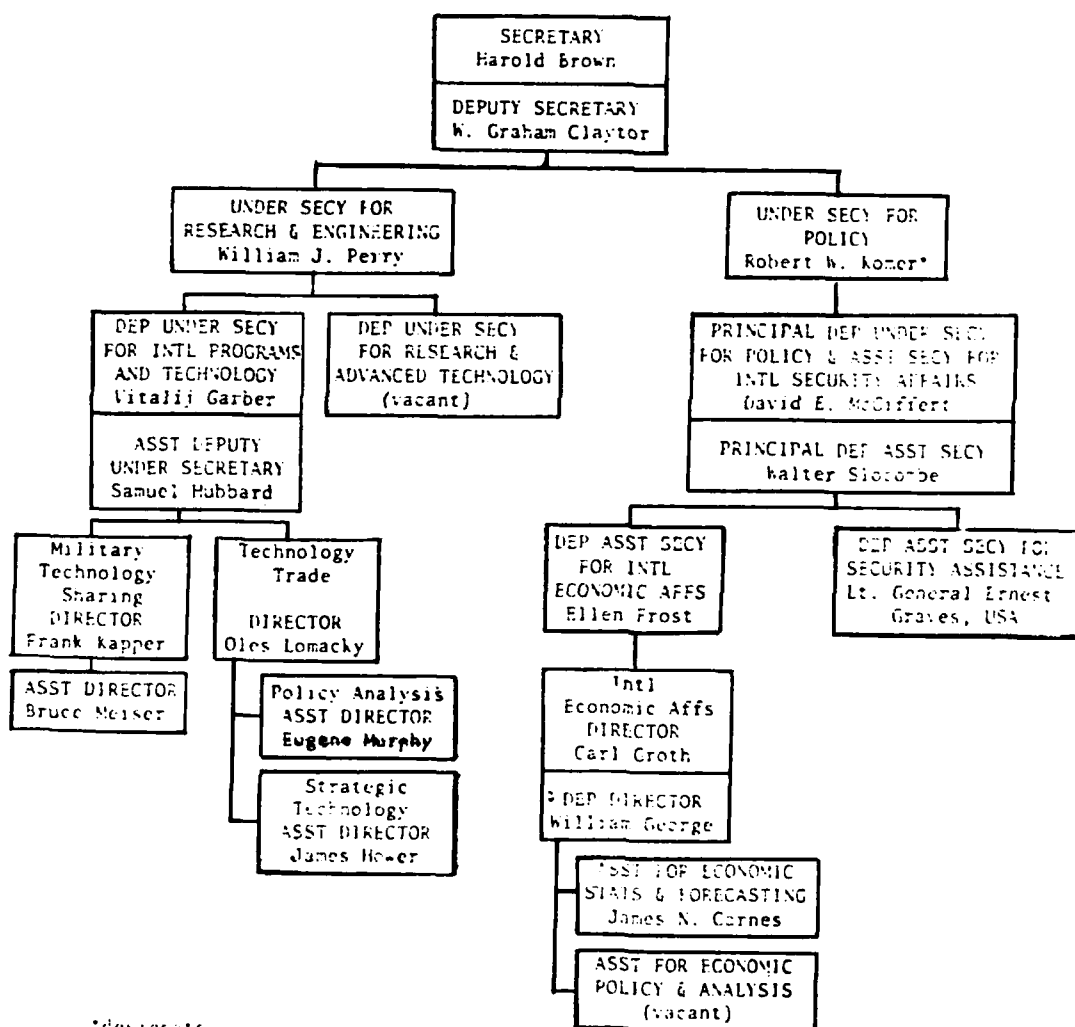


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DEFENSE DEPARTMENT -- INTERNATIONAL BUSINESS POLICY



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NOTES

NOTES ON CHAPTER I (Pages 1-4)

1. "Controlling Export of Technology," Aviation Week & Space Technology (26 March 1979), p. 9 (hereinafter cited as "Controlling," Aviation Week).
2. American Enterprise Institute, Legislative Analyses, Proposals for Reform of Export Controls for Advanced Technology (Washington, DC: American Enterprise Institute, 1979), p. 5 (hereinafter cited as American, Reform).
3. Interviews with Walter E. Grant, Defense Intelligence Agency, Washington, DC, January 1981 to March 1981 (hereinafter cited as Interviews, Grant).
4. U.S. Congress, House, Committee on Foreign Affairs, Export of Technology to Communist Countries, an Address by J. Fred Bucy, Appendix 23 to Extension and Revision of the Export Administration Act, 96th Cong., 1st sess., 1979, p. 1024 (hereinafter cited as Bucy, Export).
5. U.S. Congress, House, Representative Michel speaking on "Soviet Science: Can It Catch Up?" 96th Cong., 2d sess., 22 May 1980, Congressional Record, E 2572.
6. U.S. Department of Defense, Office of the Director of Defense Research and Engineering, Report of the Defense Science Board Task Force on Export of U.S. Technology (Washington, DC: 1976), p. ii (hereinafter cited as U.S. Department of Defense, Report).

NOTES ON CHAPTER II (Pages 5-13)

1. "Controlling," Aviation Week, p. 9.
2. U.S. Department of Defense, Report, pp. vii-xi.

3. Ibid., pp. 18-19.
4. U.S. Congress, Senate, Committee on Armed Services, Department of Defense Authorization for Appropriations for Fiscal Year 1980, S 428, 96th Cong., 1st sess., 1979, p. 2806.
5. Arnaud de Borchgrave and Michael Ledeen, "Selling Russia the Rope," The New Republic, 13 December 1980, p. 16 (hereinafter cited as de Borchgrave, "Rope").
6. U.S. Department of Defense, Report, p. xiii.
7. Ibid.
8. Ibid., p. 34.
9. Ibid.
10. Ibid., pp. 35-36.
11. Ibid.
12. Ibid.
13. Ibid.
14. Bucy, Export, p. 1020.
15. Ibid.
16. Ibid.
17. Ibid., pp. 1021-2.
18. Ibid., pp. 1023.
19. Ibid., p. 1024.
20. Ibid.
21. U.S. Congress, House, Representative Paul Findley speaking on "Technology Transfer, Part I: 'The Bucy Report is Still Right,'" 96th Cong., 2d sess., 22 July 1980, Congressional Record, E 3507.

NOTES ON CHAPTER III (Pages 14-24)

1. U.S. Congress, Senate, Committee on Banking, Housing, and Urban Affairs, U.S. Export Control Policy and Extension of the Export Administration Act, Part I, Hearings Before the Committee on Banking, Housing, and Urban Affairs, 96th Cong., 1st sess., 1979, p. 115.

2. U.S. Congress, Senate, Senator Garn speaking on "The Dangerous Side Effects of Strategic Trade with the Soviet Bloc," 96th Cong., 2d sess., 29 July 1980, Congressional Record, S 10223 (hereinafter cited as U.S. Congress, Senate, "Garn on Dangerous").

3. Ibid.

4. Ibid.

5. Ibid.

6. de Borchgrave, "Rope," p. 14.

7. Ibid.

8. Dr. Miles Costick, The Soviet Military Power as a Function of Technology Transfer from the West (Washington, DC: Institute on Strategic Trade, 1979), p. 1 (hereinafter cited as Costick, Soviet).

9. de Borchgrave, "Rope," p. 14.

10. Costick, Soviet, p. 5.

11. Ralph Kinner Bennett, "Soviet Military Might: Made in USA," Reader's Digest, August 1980, p. 76 (hereinafter cited as Bennett, "Soviet Military").

12. "US Still Selling Technology to Russia," To The Point, 8 August 1980, p. 27.

13. U.S. Congress, Senate, "Garn on Dangerous," S 10223-5.

14. Ibid.

15. Ibid.

16. Ibid.

17. Ibid.

18. Ibid.

19. Ibid.

20. Ibid.

21. Ibid.

22. Ibid.

23. Interviews with Carl E. Burk, Central Intelligence Agency, Air War College, Maxwell AFB, AL, September 1980 to April 1981 (hereinafter cited as Interviews, Burk).

24. U.S. Congress, Senate, "Garn on Dangerous," S 10223-5.

25. Interviews, Burk.

26. U.S. Department of Defense, Report, p. ii; and U.S. Congress, Senate, "Garn on Dangerous," S 10223-5.

NOTES ON CHAPTER IV (Pages 25-32)

1. U.S. Congress, Senate, Senator Garn speaking on "An Office of Strategic Trade," 96th Cong., 2d sess., 30 September 1980, Congressional Record, S 14176-7 (hereinafter cited as U.S. Congress, Senate, "Garn on Strategic").

2. Ibid.

3. Ibid.

4. Ibid.

5. Ibid.

6. Ibid.
7. Ibid.
8. Ibid.
9. Ibid.
10. Ibid.
11. Ibid.
12. Ibid.
13. Ibid.
14. Ibid.
15. Ibid.

NOTES ON CHAPTER V (Pages 33-45)

1. Interviews, Burk.
2. U.S. Congress, Senate, Permanent Subcommittee on Investigations, Transfer of Technology and the Dresser Industries Export Licensing Actions (Washington, DC: U.S. Government Printing Office, 1979), pp. 6-15 (hereinafter cited as U.S. Congress, Senate, "Dresser Actions").
3. Ibid.
4. Ibid., p. 8.
5. de Borchgrave, "Rope," pp. 13-16.
6. U.S. Congress, Senate, "Dresser Actions,"
p. 8.
7. Ibid., pp. 6-8.

8. Interviews with Lt. Col. James W. Dearlove, USA, Defense Intelligence Agency, Washington, DC, April 1980 to April 1981 (hereinafter cited as Interviews, Dearlove).

9. U.S. Congress, Senate, "Dresser Actions,"
p. 9.

10. Ibid.

11. Ibid.

12. Ibid., p. 15.

13. Backgrounder, Office of Export Technology, Department of Commerce, Washington, DC: undated.

14. U.S. Congress, Senate, "Dresser Actions,"
p. 15.

15. Washington International Organizational Guide #79-10, International Business Government Counsellors, Inc., Washington, DC: October 15, 1979.

16. U.S. Congress, Senate, "Dresser Actions,"
p. 15.

17. Ibid.; and Interview with Dr. Lloyd Lehn, Office of Defense Research and Engineering, Washington, DC, February 1981.

18. U.S. Congress, Senate, "Dresser Actions,"
p. 15.

19. Ibid.

20. Interviews with Col. John Hager, USAF, Director, Critical Technologies Office, Office of the Under Secretary of Defense for Research and Engineering, Washington, DC, March 1981 (hereinafter cited as Interviews, Hager).

21. U.S. Congress, Senate, "Dresser Actions,"
p. 15.

22. Ibid., pp. 15-16.

23. Ibid., p. 16.

24. Ibid.

NOTES ON CHAPTER VI (Pages 46-60)

1. U.S. Congress, House, Representative Findley speaking on "Technology Transfer: Part IV--Inequality of U.S.-U.S.S.R. 'Student' Exchange Programs," 96th Cong., 2d sess., 20 August 1980, Congressional Record, E 3899 (hereinafter cited as U.S. Congress, House, "Findley on Inequality").

2. Interview with Edward Hurwitz, State Department, Washington, DC, March 1981; and Interview, Burk.

3. U.S. Congress, Representative Findley speaking on "Training the Soviets to Fill In the Gaps," 96th Cong., 2d sess., 23 July 1980, Congressional Record, E 3559 (hereinafter cited as U.S. Congress, House, "Findley on Soviets").

4. Ibid.

5. Ibid.

6. U.S. Congress, House, "Findley on Inequality,"
E 3900.

7. Ibid.

8. Ibid.

9. Ibid., E 3899.

10. Ibid., E 3899-3900.

11. U.S. Congress, House, "Findley on Soviets,"
E 3559.

12. Ibid.

13. Ibid.

14. Ibid.
15. Ibid.
16. Ibid.
17. U.S. Congress, House, "Findley on Inequality,"
E 3899.
18. Interviews with Dr. Kenneth R. Whiting,
Institute for Professional Development, Air University,
Maxwell AFB, AL, March 1981.
19. Great Soviet Encyclopedia, 3rd ed., "Academy
of Sciences of the Union of Soviet Socialistic Republics,"
by M. V. Keldysh (hereinafter cited as Great Soviet).
20. "From Five-Year Plan to Five-Year Plan:
Results of the Fulfillment of the USSR State Plan for
Economic and Social Development in 1980," Pravda,
24 January 1981, pp. 1-2.
21. Great Soviet.
22. U.S. Congress, House, "Findley on Soviets,"
E 3559.
23. Ibid.
24. Ibid.
25. Ibid.
26. Ibid.
27. Interviews, Burk.

NOTES ON CHAPTER VII (Pages 61-63)

1. U.S. Congress, Senate, Senator Byrd speaking
on "The Embargo is Failing," 96th Cong., 2d sess., 18
March 1980, Congressional Record, S 2531 (hereinafter
cited as U.S. Congress, Senate, "Byrd on the Embargo").

2. Gregory Gordon, "WEBSTER," United Press International, UPI 126, Washington, DC, UPI 12-16-80 06:01 PES. From the UPI Log of 16 December 1980.

3. Ibid.

4. Ibid.

5. Ibid.

6. Ibid.

NOTES ON CHAPTER VIII (Pages 64-75)

1. U.S. Congress, Senate, "Byrd on the Embargo," S 2531.

2. Ibid.

3. U.S. Congress, House, Representative Ashbrook speaking on "Helping the Soviets Help Themselves to American Technology," 96th Cong., 2d sess., 12 March 1980, Congressional Record, H 1823.

4. Ibid.

5. Ibid.

6. Ibid.

7. U.S. Congress, Senate, "Byrd on the Embargo," S 2531.

8. Ibid.

9. Ibid.

10. Ibid.

11. Ibid., S 2529.

12. U.S. Congress, Senate, Senator Jackson speaking on "The Export Administration Act of 1979, S 737," 96th Cong., 1st sess., 18 July 1979, Congressional Record, S 9791 (hereinafter cited as U.S. Congress, Senate, "Jackson on Export").

13. U.S. Congress, House, Representative Cleveland speaking on "Export Controls and the Honest Public Servant, Larry Brady," 96th Cong., 1st sess., 13 September 1979, Congressional Record, H 7895 (hereinafter cited as U.S. Congress, House, "Cleveland on Controls").

14. U.S. Congress, Senate, "Garn on Dangerous," S 10225.

15. U.S. Congress, Senate, "Jackson on Export," S 9792.

16. Ibid.

17. U.S. Congress, Senate, "Garn on Dangerous," S 10223.

18. U.S. Congress, Senate, "Jackson on Export," S 9792.

19. U.S. Congress, House, "Cleveland on Controls," H 7896.

20. Bennett, "Soviet Military," p. 76.

21. U.S. Congress, Senate, Senator Garn speaking on "Commerce End-Runs President's Trade Embargo Against the Soviet Union," 96th Cong., 2d sess., 4 March 1980, Congressional Record, S 2155.

22. "Lawrence Brady Named to Commerce Post," Defense Daily, 4 March 1981, p. 1.

23. U.S. Congress, House, "Cleveland on Controls," H 7895.

24. Ibid.

25. U.S. Congress, Senate, "Garn on Dangerous," S 10226.

26. Ibid.

27. Ibid.

28. Ibid.

29. Ibid.
30. Ibid.
31. Ibid., p. 10225.
32. Ibid.
33. U.S. Congress, House, Representative Ichord speaking on an amendment, 96th Cong., 1st sess., 11 September 1979, Congressional Record, H 7670.

NOTES ON CHAPTER IX (Pages 76-81)

1. U.S. Controller General, Observations on Collection and Dissemination of Scientific, Technical, and Engineering Information, 19 March 1976, p. 1.
2. Ibid.
3. Department of Commerce, Assistant Secretary for Productivity, Technology, and Innovation (Washington, DC: Federal Organization Service, 1980), p. 3.5.
4. U.S. Controller General, Observations, pp. 3-4.
5. National Technical Information Service, NTIS Annual Report for 1977, Washington, DC, 1977, p. 3 (herein-after cited as NITS, Report).
6. U.S. General Services Administration, United States Government Manual 1980-1981, p. 160.
7. U.S. Department of Commerce, The NTIS Directory of Computerized Data Files and Related Software, 1974, p. i.
8. Ibid.
9. NITS, Report, p. 9.
10. Ibid.

11. Ibid., p. 11.
12. Ibid.
13. Ibid., p. 15.
14. Ibid.
16. Interviews, Burk.
17. Interviews, Dearlove, and Interviews, Grant.
18. NITS, Report, p. 5.
19. de Borchgrave, "Rope," p. 14.

NOTES ON CHAPTER X (Pages 82-96)

1. U.S. Congress, Senate, "Garn on Strategic," S 14176-7.
2. Ibid.
3. U.S. Congress, Senate, Senator Warner speaking on "Technology Transfer and National Security," 96th Cong., 2d sess., 19 September 1980, Congressional Record, S 12985-6.
4. Ibid.
5. U.S. Congress, Senate, Senator Garn speaking on "National Security Sensitive Technology Sales to Soviets," 96th Cong., 2d sess., 15 May 1980, Congressional Record, S 5485.
6. U.S. Congress, Senate, Senator Garn speaking on "S 2606: A Bill to Establish an Office of Strategic Trade," 96th Cong., 2d sess., 24 April 1980, Congressional Record, S 4206-8.
7. Ibid.
8. Ibid.
9. Ibid.

10. Ibid.
11. Ibid.
12. Interviews, Hager.
13. Ibid.
14. Ibid.
15. Ibid.
16. Ibid.
17. Ibid.
18. Ibid.
19. Interviews, Burk.
20. Ibid.

21. Interview with Lawrence J. Brady, Assistant Secretary of Commerce for Trade Administration, Washington, DC, March 1981.

22. Ibid.
23. Ibid.
24. Ibid.
25. Ibid.

NOTES ON CHAPTER XI (Pages 97-100)

1. American Enterprise Institute, Proposals for Reform of Export Controls for Advanced Technology (Washington, DC: American Enterprise Institute, 1979), p. 21.

2. Ibid.
3. Costick, Soviet, p. 4.

4. Ibid.
5. American, "Reform," pp. 21-22.
6. Lt. Col. Edward J. Philbin, Soviet Technology: Status, Trends, and Strategies, Air University Report 445 (Maxwell AFB, AL: Air University, 1978), pp. 3-4.
7. Costick, Soviet, p. 2.

NOTES ON CHAPTER XII (Page 101)

1. Carl Gershman, "Selling Them the Rope, Business, and the Soviets," Commentary, April 1979, p. 35.
2. Ibid.
3. Bennett, "Soviet Military," p. 76.

BIBLIOGRAPHY

American Enterprise Institute. Legislative Analyses, Proposals for Reform of Export Controls for Advanced Technology. Washington, DC: American Enterprise Institute for Public Policy Research, 1979.

"An Engineer's View of Electric Power Development in the Soviet Union." Detroit Times, 12-16 September 1958, a five-part series by Walker L. Cisler, president, Detroit Edison, and Jack Pickering, science writer, Detroit Times.

Anderson, Jack. "Soviets Buying Sensitive U.S. Computers." Washington Post, 16 July 1979, p. D12.

_____. "U.S. Computers Feared Vulnerable." Washington Post, 15 August 1978, p. E11.

Bennett, Ralph Kinney. "Soviet Military Might: Made in USA." Reader's Digest, August 1980, pp. 75-78.

Brady, Lawrence J., Assistant Secretary of Commerce for Trade Administration, Department of Commerce, Washington, DC. Interview, March 1981.

Bucy, J. Fred. "Export of Technology to Communist Countries." An Address by J. Fred Bucy to the Armed Forces Communications and Electronics Association (AFCEA) Symposium, Washington, DC, 11 January 1979. Appendix 23 to U.S. Congress, House, Committee on Foreign Affairs, etc.

_____. "On Strategic Technology Transfer to the Soviet Union." International Security, Spring 1977, p. 25.

_____. "Technology Transfer and East-West Trade." International Security, Winter 1980/81, pp. 132-151.

- Bulkeley, William M. "Concern Grows Over Rising U.S. Exports of Skilled Technology to Overseas Firms." Wall Street Journal, 5 September 1979, p. 44.
- Burk, Carl E., Central Intelligence Agency, Advisor to Commander, Air University and faculty member, Air War College, Maxwell AFB, AL. Continuing conversations, September 1980 to April 1981.
- Burt, Richard. "Technology Sales Rules Under Fire." New York Times, 18 June 1979, pp. D1-D2.
- Carrick, Roger J. East-West Technology Transfer in Perspective. Berkeley, CA: Institute of International Studies, University of California, 1978.
- Carter, Jimmy. Report to the Congress in Response to Section 24 of the International Security Assistance Act of 1977. Washington, DC: The White House, 1978.
- "China Would Sell 'Critical' Metals in Exchange for U.S. Technology." The Washington Star, 11 September 1980.
- "Computer Sale to Soviets Blocked." Aviation Week & Space Technology, 20 June 1977, p. 23.
- "Computers for Russia--A Businessman's View." U.S. News & World Report, 18 December 1978, p. 24.
- Conference on Security and Co-operation in Europe, Final Act. London: Her Majesty's Stationery Office, 1975.
- Contacts with the Soviet Union. COPY Draft Paper Unk source. Was classified.
- "Controlling Export of Technology." Aviation Week & Space Technology, 26 March 1979, p. 9.
- Costick, Dr. Miles. The Soviet Military Power as a Function of Technology Transfer from the West. Washington, DC: Institute on Strategic Trade, 1979.

Currie, Dr. Malcolm R. "Is the Short Term Gain an Illusion?" Armed Forces Journal International, January 1974, p. 31.

Dearlove, James W., LTC, USA, Defense Intelligence Agency, Office of Technology Transfer (DT-1A), Washington, DC. Continuing conversations, April 1980 to April 1981.

de Borchgrave, Arnaud, and Ledeen, Michael. "Selling Russia the Rope." The New Republic, 13 December 1980, pp. 13-16.

Defense Science Board. Highlights of the Final Report on Export of U.S. Technology. Washington, DC: Defense Science Board, 1976.

Demarcation Lines in Technology Control. Diagram. Unk source.

Department of Commerce, Assistant Secretary for Productivity, Technology, and Innovation. Washington, DC: Federal Organization Service, Carroll Publishing Co., 1980, p. 3.5.

Doctors, Samuel I. The Role of Federal Agencies in Technology Transfer. Cambridge, MA: The M.I.T. Press, 1969.

"Editor or Lobbyist?" Armed Forces Journal International, January 1974, p. 27.

"Exploiting Soviet Vulnerabilities." National Security Review, August 1980, pp. 1-3.

"Export Policy Seen Harmful to CoCom." Aviation Week & Space Technology, 10 September 1979, pp. 26-27.

Exports to China--Washington Roundup. Aviation Week and Space Technology, 22 September 1980, p. 13.

FBI Moves to Check Soviets. Washington Post, 4 March 1981, p. 1.

From Five-year Plan to Five-year Plan: Results of the Fulfillment of the USSR State Plan for Economic and Social Development in 1980. Pravda, 24 January 1981, pp. 1-2.

Gershman, Carl. "Selling Them the Rope, Business, and the Soviets." Commentary, April 1979, pp. 35-54.

Gessert, Robert A. NATO Standardization and Technology Transfer. McLean, VA: General Research Corp. for Office of Assistant Secretary of Defense for International Security Affairs, 1978.

Glennan, Dr. T. Keith. Technology and Foreign Affairs. Washington, DC: Department of State, 1976.

Gordon, Gregory. "WEBSTER." United Press International UP 126, Washington, DC, UPI 12-16-80 06:01 PES.

Gosnell, Jack. U.S. Department of State, Speech, "Negotiating and Working with the Soviet Bureaucracy," Section II, pp. 10-23.

Grant, Walter E., Defense Intelligence Agency (DT-1A), Washington, DC, Interviews, January 1981 to March 1981.

The Great Soviet Encyclopedia, A Translation of the Third Edition. S.v. "Academy of Sciences of the Union of Soviet Socialist Republics," by M. V. Keldysh.

Hager, John, Colonel, USAF, Director, Critical Technologies Project, Office of the Under-Secretary of Defense for Research and Engineering, Deputy Under-Secretary for International Programs and Technology, Washington, DC. Interviews, March 1981.

Hanson, Philip. "Western Technology in the Soviet Economy." Problems of Communism, November-December 1978, pp. 20-30.

Hayden, Eric W. Technology Transfer to East Europe. New York: Praeger Publishers, 1976.

"High-Tech Sales to U.S.S.R. Further Reduced," Science,
4 April 1980, pp. 36-37.

Holliday, George D. Technology Transfer to the USSR,
1928-1937 and 1966-1975: The Role of Western
Technology in Soviet Economic Development.
Boulder, CO: Westview Press, 1979.

Hough, Granville W. Technology Diffusion. Mount Airy,
MD: Lomond Books, 1975.

"The House and Export Controls." National Security
Record, September 1979, p. 4.

Hunt, Terence. "Did U.S. Aid Soviets on Missile?"
Philadelphia Inquirer, 9 November 1979, p. 3.

Hurwitz, Edward (NMI), State Department, Office of Soviet
Exchanges, Washington, DC. Interview, 20 March
1981.

"If the Russians Are Going to Steal Our Secrets. . . ."
National Review, 22 June 1979, p. 775.

"Industry Seeks Formal Export 'Right.'" Aviation Week &
Space Technology, 19 March 1979, p. 27.

International Business Government Counsellors (IBGC).
Washington International Organization Guide
#79-10, Department of Defense--International Busi-
ness Policy. Washington, DC: IBGC, 1979.

"Investigation Sought in Technology Transfer to Soviet
Union." Defense/Space Daily, 16 June 1977, p. 57.

"Japanese Open Offensive for Technological Gains with
Robot Development." The Washington Post, 13 Octo-
ber 1980, p. A38.

Johnsen, Katherine. "DOD Civil Export Control Rule Urged."
Aviation Week & Space Technology, 19 March 1979,
pp. 27-28.

_____. "Technology Export Control Advances." Aviation
Week & Space Technology, 30 July 1979, p. 16.

- "Lawrence Brady Named to Commerce Post." Defense Daily,
4 March 1981, p. 1.
- Lehn, Dr. Lloyd, Office of Defense Research and Engineer-
ing, Washington. Interview, February 1981.
- Littlepage, 1st Lt. Fred F., USAF. The Committee on
Exchanges. Washington, DC: Defense Intelligence
School, June 1978.
- Muhn, Van, Major, USAF. The Freedom of Information Act:
Its Impact on the Contractor Technical Proposal.
Maxwell AFB, AL: Air University, 1979.
- Nanyenya-Takirambudde, Peter. Technology Transfer and
International Law. New York: Praeger Publishers,
1980.
- National Security Foundation. Technology Transfer and
Utilization. Washington, DC: National Academy
of Engineering by the Committee of Technology
Transfer and Utilization, 1974.
- "National Suicide, Military Aid to the Soviet Union."
Officer Review, May 1978, pp. 4-7.
- "NATO: U.S. Policy." Gist, September 1978, Bureau of
Public Affairs, Department of State.
- Nau, Henry R. Technology Transfer and U.S. Foreign Policy.
New York: Praeger Publishers, 1976.
- Naval Postgraduate School. Technology Transfer in Science
Technology and Public Policy? 1977-78.
- Norris, William C. "A More Hopeful View." Armed Forces
Journal International, January 1974, p. 33.
- Oliver, John B., and Weiss, Elliot J. "Is Selling Tech-
nology to the Soviets Dangerous?" Harvard Business
Review, January-February 1975, pp. 18-19.
- "Out on the Steppes, a Multibillion-Dollar Showcase of U.S.
Know-How." U.S. News & World Report, 18 December
1978, p. 25.

Parker, E. C., Lt. Col. USAF. Foreign Transfer of Technology, A Case Study of the GE/SNECMA 10-ton Engine Venture. Maxwell AFB, AL: Air University, 1974.

Pavlic, Dr. Breda. "Communication Policies and Transfer of Technology." Review of International Affairs, 5 January 1980, pp. 16-20.

"Perry Says No Solid Evidence Kama Engines Used by Soviet Military." Defense/Space Daily, 30 November 1979, p. 131.

Philbin, Edward J., Lt. Col. USAFR. Soviet Technology: Status, Trends, and Strategies. Maxwell AFB, AL: Air University, 1978.

Pincus, Walter. "Soviet Misuse of U.S. Machinery Seen." Washington Post, 9 November 1979, p. 18.

Quinn, Major, Joseph E. USAFR. Disembodied Technology Transfer: The Human Side of Soviet Acquisition of U.S. Technology. Maxwell AFB, AL: Air University, 1979.

"Redistributing Technology." Commentary, January 1979, pp. 52-54.

Reinhold, Robert. "U.S.-Soviet Scientific Freeze Cuts Both Ways." New York Times, 27 January 1981, p. C1.

Ross, Brian. [Soviet Target: Advanced American Technology.] NBC Nightly News, Transcript by Radio--TV Defense Dialog. Washington, DC: Department of the Air Force (SAFFA), 9-11 December 1980.

"Russia's Secret Weapon: U.S. Technology." U.S. News & World Report, 17 March 1980, pp. 51-52.

Sobeslavsky, Vladimir. "East-West Detente and Technology Transfer." The World Today, October 1980, pp. 374-381.

"Spying on U.S. Business." Newsweek, 12 November 1979, p. 43.

"Technical Bonanza for Soviets?" Armed Forces Journal International, January 1974, pp. 27-33.

"A Technology to Transform War." Time, 15 September 1980, p. 87.

"Technology Transfer and Export Controls." National Security Record, September 1979, pp. 1-3.

"Technology Transfer, How the West is Arming Russia." London Daily Telegraph, 8 September 1980, p. 1.

Toth, Robert C. "Soviet Army's Mobility Was Made in USA." Los Angeles Times, 13 January 1980, p. 1.

"Trade Dept. Urged in Senate Report." Aviation Week & Space Technology, 19 March 1979, p. 28.

"Trading Information." Europe, July-August 1980, pp. 24-25.

"Trading with Russia--A Dangerous Game?" U.S. News & World Report, 18 December 1978, pp. 22-25.

"The Transfer of Technology from West to East." OECD Observer, November 1979, pp. 25-30.

Tross, Carl H., ed. Export of Aerospace Technology. San Diego, CA: For American Astronautical Society, by Univelt, Inc., 1978.

Udis, Bernard. From Guns to Butter: Technology Organizations and Reduced Military Spending in Western Europe. Cambridge, MA: Ballinger Publishing Co., 1978.

U.S. Central Intelligence Agency. Analysis of a Soviet Handheld Computer. Washington, DC: National Foreign Assessment Center, 1979. CIA SI 79-10082 October 1979.

_____. Mechanisms for Soviet Acquisition of U.S. Technology. Washington, DC: Central Intelligence Agency, 1976. CIA SI 76-10028.

_____. Soviet Strategy and Tactics in Economic and Commercial Negotiations with the United States. Washington, DC: National Foreign Assessment Center, 1979. FR 79-10276.

U.S. Congress, House, Committee on Foreign Affairs.
Extension and Revision of the Export Administration Act of 1969. Hearings and Markup Before the Subcommittee on International Economic Policy and Trade, 96th Cong., 1st sess., 1979.

_____. The Role of Intelligence in the Foreign Policy Process. Hearings Before the Subcommittee on International Security and Scientific Affairs, 96th Cong., 2d sess., 1980.

_____. Technology Exports: Department of Defense Organization and Performance. Hearing Before the Subcommittee on International Economic Policy and Trade, 96th Cong., 1st sess., 1979.

U.S. Congress, House, Committee on Science and Technology.
Defining Policies of the United States with Respect to Scientific and Technical Exchanges with the Soviet Union. House Report 96-921, Part I, 96th Cong., 2d sess., 1980.

_____. Key Issues in U.S.-U.S.S.R. Scientific Exchanges and Technology Transfers, Hearings Before the Subcommittee on Domestic and International Scientific Planning, Analysis, and Cooperation, 95th Cong., 2d sess., 1978.

_____. Technology Transfer Conference. Hearings Before the Subcommittee on Science, Research, and Technology, 96th Cong., 1st sess., 1979.

_____. Key Issues in U.S.-U.S.S.R. Scientific Exchanges and Technology Transfer. A Report Prepared by the Subcommittee on Science, Research, and Technology, 96th Cong., 1st sess., 1979.

U.S. Congress, House. International Transfer of Technology. Report to the President of the Congress, Subcommittee on International Security and Scientific Affairs, 95th Cong., 2d sess., 1978.

_____. Representative Ashbrook speaking on Aiding the Arsenal of Oppression, 96th Cong., 1st sess., 20 September 1979. Congressional Record, Vol. 125, E 4660-E 4661.

_____. Representative Ashbrook speaking on Helping the Soviets Help Themselves to American Technology, 96th Cong., 2d sess., 12 March 1980. Congressional Record, Vol. 126, H 1822-H 1825.

_____. Representative Cleveland speaking on Export Controls and the Honest Public Servant, Larry Brady, 96th Cong., 1st sess., 13 September 1979. Congressional Record, Vol. 125, H 7895-H 7897.

_____. Representative Findley speaking on Technology Transfer, Part I: "The Bucy Report is Still Right," 96th Cong., 2d sess., 22 July 1980. Congressional Record, Vol. 126, E 3507.

_____. Representative Findley speaking on Technology Transfer, Part II: Soviet Scientific Knowledge, 96th Cong., 2d sess., 23 July 1980. Congressional Record, Vol. 125, E 3527.

_____. Representative Findley speaking on Technology Transfer, Part IV: Inequality of U.S.-U.S.S.R. "Student" Exchange Programs., 96th Cong., 2d sess., 20 August 1980. Congressional Record, Vol. 126, E 3899-E 3901

_____. Representative Findley speaking on Training the Soviets to Fill in the Gaps, 96th Cong., 2d sess., 23 July 1980. Congressional Record, Vol. 126, E 3558-E 3560.

_____. Representative Ichord speaking on an amendment on Military Critical Technologies, 96th Cong., 1st sess., 11 September 1979. Congressional Record, Vol. 125, H 7665-H 7682.

- _____. Representative Michel speaking on Soviet Science, Can It Catch Up? 96th Cong., 2d sess., 22 May 1980. Congressional Record, Vol. 126, E 2572-E 2573.

- _____. Representative Miller speaking on Technology Transfer Continues, 96th Cong., 2d sess., 12 June 1980. Congressional Record, Vol. 126, H 4923-H 4924.

- _____. Representative Ottinger speaking on The Future of U.S.-U.S.S.R. Scientific Cooperation, 96th Cong., 2d sess., 6 March 1980. Congressional Record, Vol. 126, E 1105.

- _____. Science, Technology, and Diplomacy in the Age of Interdependence. Prepared for the Subcommittee on International Security and Scientific Affairs, Committee on International Relations. Committee Print. Washington, DC: U.S. Government Printing Office, 1976.

- _____. Technology Transfer and Scientific Cooperation Between the United States and the Soviet Union: A Review. Committee Print. Washington, DC: U.S. Government Printing Office, 1977.

- U.S. Congress, Joint Economic Committee. Allocation of Resources in the Soviet Union and China--1977. Hearings Before the Subcommittee on Priorities and Economy in Government, 95th Cong., 1st sess., 1977, Part 3.

- _____. Allocation of Resources in the Soviet Union and China--1978. Hearings Before the Subcommittee on Priorities and Economy in Government. Part IV: Soviet Union, 95th Cong., 2d sess., 1978.

- _____. Issues in East-West Commercial Relations, A Compendium of Papers Submitted to the Joint Economic Committee. Joint Committee Print, 95th Cong., 2d sess., 1979.

- _____. Soviet Economy in a Time of Change. A Compendium of Papers, Vol. 2, 96th Cong., 1st sess., 1979.

U.S. Congress, Office of Technology Assessment.

Technology and East-West Trade. Washington, DC:
Office of Technology Assessment, 1979.

U.S. Congress, Senate, Committee of Armed Services.

Department of Defense Authorization for Appropriations for Fiscal Year 1980. Part 6: Research and Development. Hearings Before the Committee on Armed Services on S 428, 96th Cong., 1st sess., 1979.

U.S. Congress, Senate, Committee on Banking, Housing, and Urban Affairs. Trade and Technology. Part II: East-West Trade and Technology Transfer. Hearing Before the Subcommittee on International Finance, 96th Cong., 1st sess., 1979.

. Trade and Technology. Part III: Trade and Technology in the Electronics Industry. Hearing Before the Subcommittee on International Finance, 96th Cong., 2d sess., 1980.

. U.S. Embargo of Food and Technology to the Soviet Union. Hearings Before the Subcommittee on International Finance, 96th Cong., 2d sess., 1980.

. U.S. Export Control Policy and Extension of the Export Administration Act. Part I. Hearings Before the Committee on Banking, Housing, and Urban Affairs, 96th Cong., 1st sess., 1979.

. U.S. Export Control Policy and Extension of the Export Administration Act. Part III. Hearing Before the Subcommittee on International Finance, 96th Cong., 1st sess., 1979.

U.S. Congress, Senate, Committee on Governmental Affairs. Transfer of Technology and the Dresser Industries Export Licensing Actions. Hearings Before the Permanent Subcommittee on Investigations, 95th Cong., 2d sess., 1978.

U.S. Congress, Senate. Senator Byrd speaking on Dangerous Trade, 96th Cong., 2d sess., 4 August 1980. Congressional Record, Vol. 126, S 10727-S 10728.

- _____. Senator Byrd speaking on the Embargo Failing, 96th Cong., 2d sess., 18 March 1980. Congressional Record, Vol. 126, S 2529-S 2533.
- _____. Senator Garn speaking on a bill to establish an Office of Strategic Trade, 96th Cong., 2d sess., 24 April 1980. Congressional Record, Vol. 126, S 4206-S 4210.
- _____. Senator Garn speaking on an Office of Strategic Trade, 96th Cong., 2d sess., 30 September 1980. Congressional Record, Vol. 126, S 14176-S 14177.
- _____. Senator Garn speaking on Commerce End-runs President's Trade Embargo Against the Soviet Union, 96th Cong., 2d sess., 4 March 1980. Congressional Record, Vol. 126, S 2155-S 2157.
- _____. Senator Garn speaking on the Dangerous Side Effects of Strategic Trade with the Soviet Bloc, 96th Cong., 2d sess., 29 July 1980. Congressional Record, Vol. 126, S 10222-S 10228.
- _____. Senator Garn speaking on National Security Sensitive Technology Sales to Soviets, 96th Cong., 2d sess., 15 May 1980. Congressional Record, Vol. 126, S 5485.
- _____. Senator Garn speaking on Office of Export Administration, 96th Cong., 2d sess., 19 September 1980. Congressional Record, Vol. 126, S 12985.
- _____. Senator Garn speaking on Soviet Nuclear Training, 96th Cong., 2d sess., 30 September 1980. Congressional Record, Vol. 126, S 14176.
- _____. Senator Garn speaking on Technology Transfers to the Soviet Union, 96th Cong., 2d sess., 18 June 1980. Congressional Record, Vol. 126, S 7303-S 7305.
- _____. Senator Jackson speaking on an amendment to the Export Administration Act of 1979 S 737, 96th Cong., 1st sess., 18 July 1980. Congressional Record, Vol. 126, S 9790-S 9795.

- _____. Senator Warner speaking on Technology Transfer and National Security, 96th Cong., 2d sess., 19 September 1980. Congressional Record, Vol. 126, S 12985-S 12986.
- _____. The Soviet Military Power as a Function of Technology Transfer from the West, 96th Cong., 1st sess., 21 July 1979. Congressional Record, Vol. 125, S 10131-S 10134.
- U.S. Controller General. Observations on Collection and Dissemination of Scientific, Technical, and Engineering Information, 19 March 1976.
- U.S. Defense Intelligence Agency. Computer Technology Transfer--Eurasian Communist Countries and Cuba. Washington, DC: U.S. Defense Intelligence Agency, 1979. DST-1750S-272-79.
- _____. Counterintelligence Memorandum. Technology Transfer: A Counterintelligence Primer on Hostile Intelligence Acquisitions of U.S. and Western Technology Abroad. Washington, DC: Defense Intelligence Agency, 1979. DIACIM 13-79 Nov.
- _____. Genetic Engineering Transfer Technology. Washington, DC: Defense Intelligence Agency, 1980. DST-1810D-933-RPT 4.
- _____. Hostile Intelligence Acquisition of Western Weapons Technology: A Case Study--The Knuefelmann Connection. Washington, DC: Defense Intelligence Agency, 1979.
- _____. Ryad Computer System. Washington, DC: Defense Intelligence Agency, 1980. DST-1750S-265-79, 10 Mar 80.
- U.S. Department of Commerce, Office of Export Administration. Background. Washington, DC: Undated.
- U.S. Department of Commerce, International Trade Administration. Comex Request for OEA Clarification of Regulations on Export Licensing of Technical Information. Memo from Henry D. Mitman to Jack Martens-Washington, DC: Department of Commerce, undated.

U.S. Department of Commerce. NTIS Annual Report for 1977.

_____. The NTIS Directory of Computerized Data Files and Related Software. NTIS-SR-74-01.

U.S. Department of Defense. Notices. "Defense Department's Initial Military Critical Technologies List and Department of Energy's List of Energy Related Military Critical Technologies." Federal Register 45, No. 327, 1 October 1980, 65014-152.

_____. Office of the Director of Defense, Research, and Engineering. Report of Defense Science Board Task Force Export of U.S. Technology. Washington, DC: Director of Defense, Research, and Engineering, 1976.

U.S. Department of Energy. Notices. "Defense Programs; List of Energy Related Military Critical Technologies." Federal Register 45, No. 192, 1 October 1980, 65152-67.

U.S. Department of State. Impact on U.S. Commercial Interests of Technology Transfer to the U.S.S.R. Washington, DC: Bureau of Intelligence and Research, 1976.

_____. Potential of Technology Transfer from the United States to the U.S.S.R. Washington, DC: Bureau of Intelligence and Research, 1977.

_____. Soviet Technological Progress and Western Technology Transfer to the U.S.S.R.: An Analysis of Soviet Attitudes. Washington, DC: Bureau of Intelligence and Analysis, 1978.

_____. Technology Transfer Through Small- and Medium-sized Firms: A Challenge. Washington, DC: Bureau of Intelligence and Research, 1978.

U.S. Directorate of Defense, Research, and Engineering. The Opportunity Cost of the Nonmonetary Advantage of the Soviet Military R&D Effort. Santa Monica, CA: Rand Corp., 1975. R1741-DDRE.

U.S. General Services Administration. United States Government Manual 1980-1981.

U.S. Office of the Director of Defense, Research, and Engineering. An Analysis of Export Control of U.S. Technology--A DOD Perspective, 4 February 1976.

"U.S.: Pentagon to Guard Sensitive Exports." Defense & Foreign Affairs Daily, 2 August 1979, p. 20.

U.S. President, Executive Office. Directory of Federal Technology Transfer. Washington, DC: Federal Coordinating Council for Science, Engineering, and Technology, 1977.

"U.S.: Quiet Decision on Soviet Sale." Defense & Foreign Affairs Daily, 10 April 1979, p. 1.

"U.S. Still Selling Technology to Russia." To The Point, 8 August 1980, p. 27.

"U.S. Technology Assisted Soviet MIRV Development--Thurmond." Defense/Space Daily, 25 July 1979, p. 117.

U.S.-U.S.S.R. Technical Cooperation Agreements: A Compendium. Source unknown, 12/14/49 Rev.

Vorona, Dr. Jack. "The Soviet March Toward Technological Superiority." Defense/80, March 1980, pp. 9-12.

"When is a Bubble Not a Bubble?" Bell Laboratories, 600 Mountain Avenue, Murray Hill, NJ 07974. Advertisement.

Whiting, Dr. Kenneth R., Air University, Maxwell AFB, AL. Interview, 26 March 1981.